

Supplementary S2, a

Atlas of textures and structures (Lower Ust-Yarega Subformation)

Ukhta River, Outcrop 14

Table 1

Figs. 1. Siltstones (greenish-gray) with interlayers and lenses of quartz oil-saturated sandstones (brown). Sample 14-75.

Figs. 2–3. Fragment of intraclast represented by bioturbated sandy limestones. Sample 14-75/1.

Fig. 4. Quartz sandstone with rare ostracod valves. Sample 14-75/2.

Figs. 5–6. 5 – deformation textures of intrusion in microlayered calcareous siltstones and mudstones; 6 – bioturbated siltstones and mudstones. Sample 14-74.

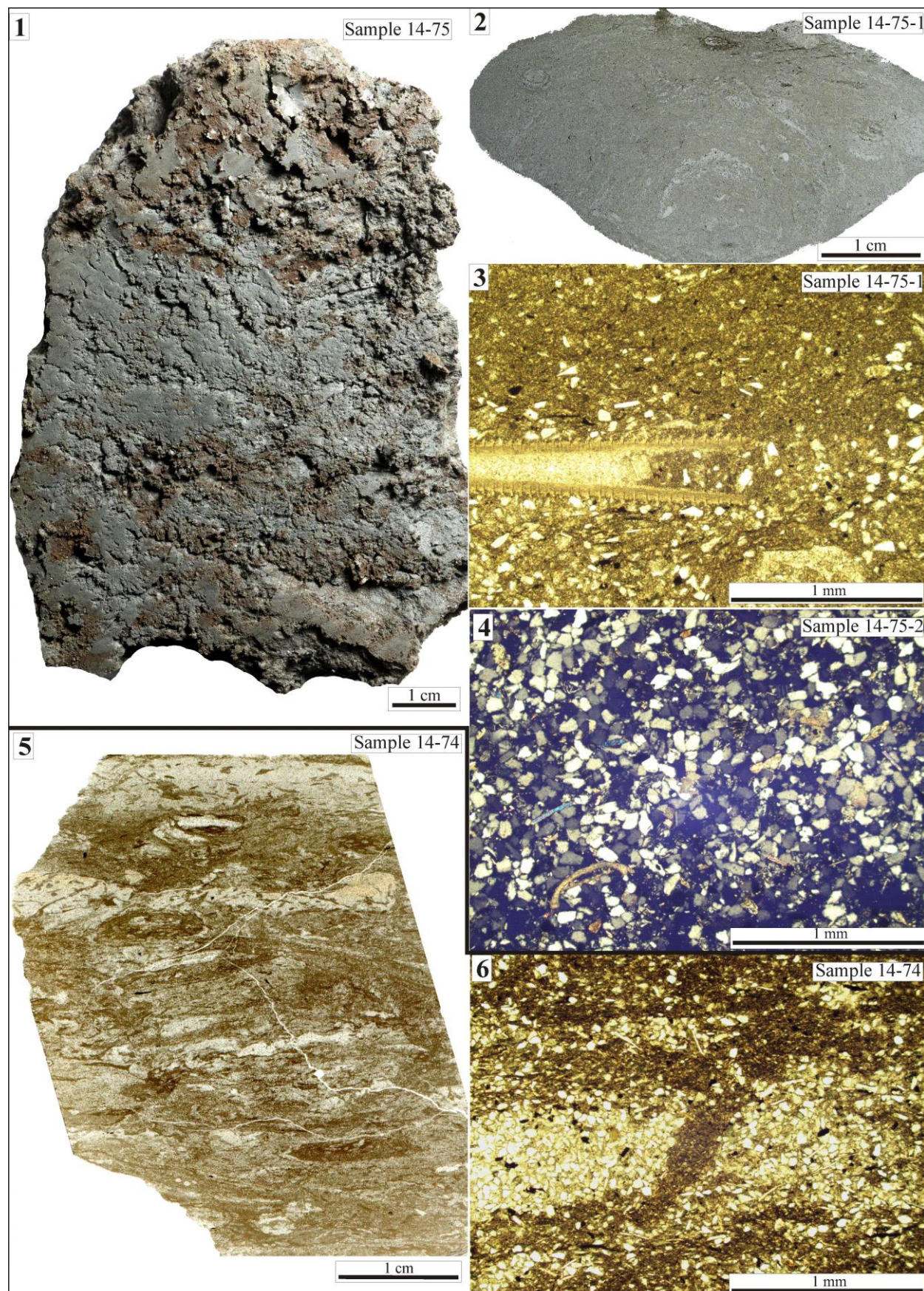


Table 2

Figs. 1–2. Deformation textures in bioturbated micro-layered calcareous siltstones and mudstones. Sample 14-73.

Figs. 3–4. Bioturbated sandstone with rare intact thin-walled ostracod shells. Sample 14-z1.

Fig. 5. Greenish-gray, weakly calcareous argillites. Sample 14-z2.

Figs. 6–8. Interlayer of bioclastic limestones in sandy, sandy-clayey limestones with rare intraclasts. Sample 14-z3.

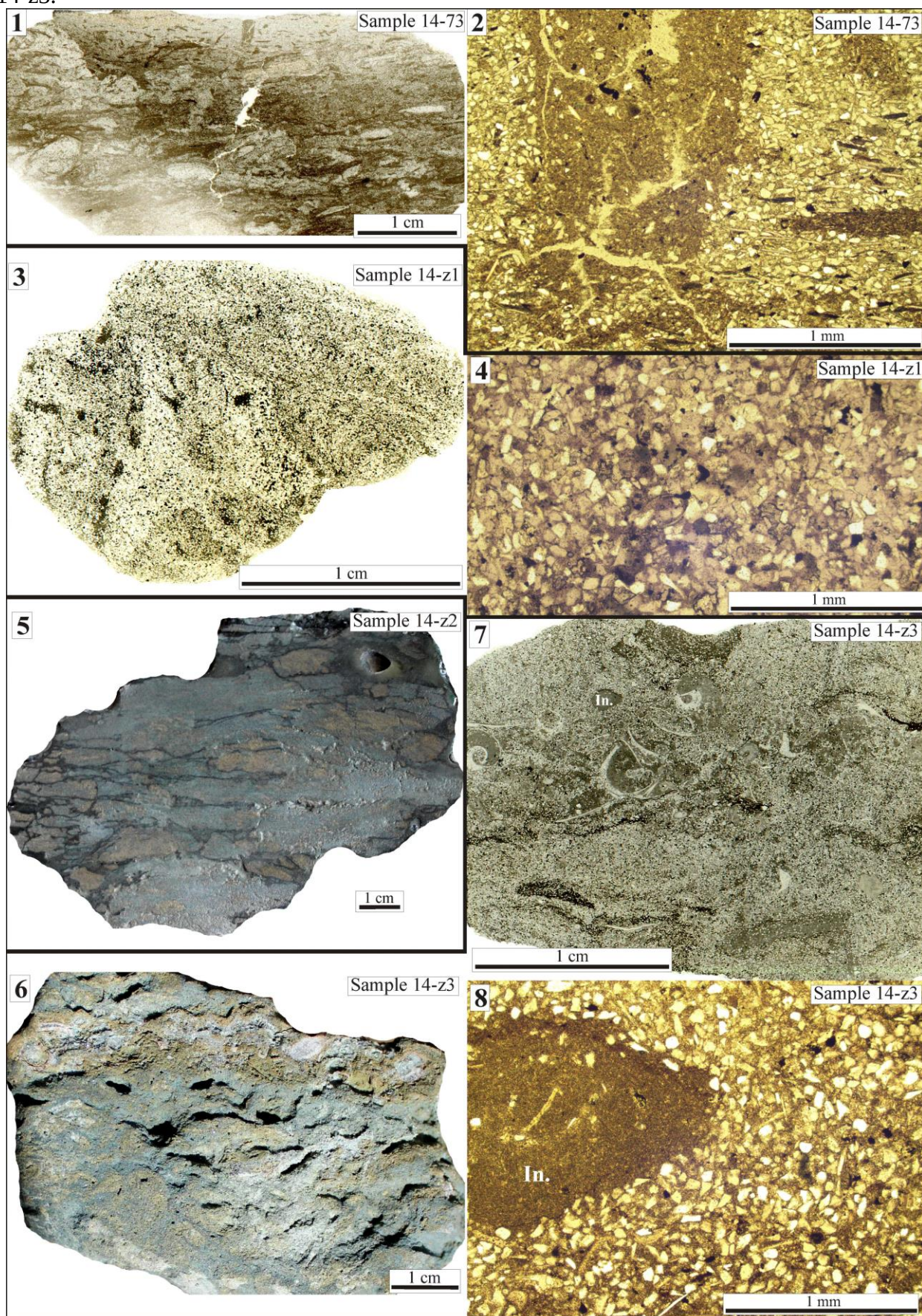


Table 3

Figs. 1–3. Bioturbated sandy limestone with rare bioclastic. Sample 14-z4.

Figs. 4–6. Sandy-clayey limestones. Sample 14-z5.

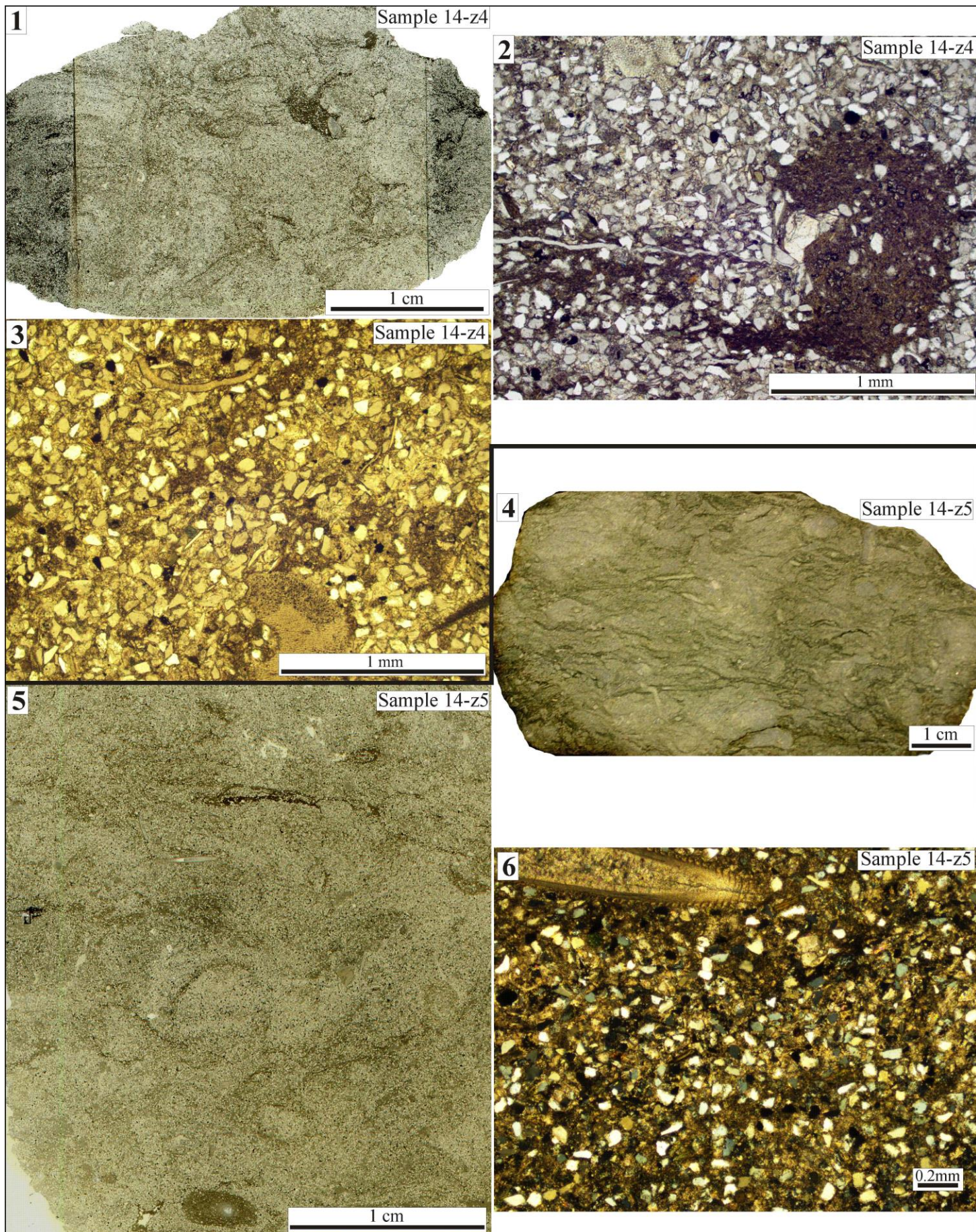


Table 4

Figs. 1–4. Poorly mechanically mixed and bioturbated sandy limestones and bioclastic pelitomorphic limestones. Sample 14-z6.

Figs. 5–6. Bioturbated argillite and silty argillite with gently wavy microlayered texture and deformation texture of intrusion. Sample 14-63.

Figs. 7–8. Micro-layered texture in claystones. Sample 14-z7.

Figs. 9–10. Unclearly layered texture with rare flakes of micaceous minerals. Sample 14-62.

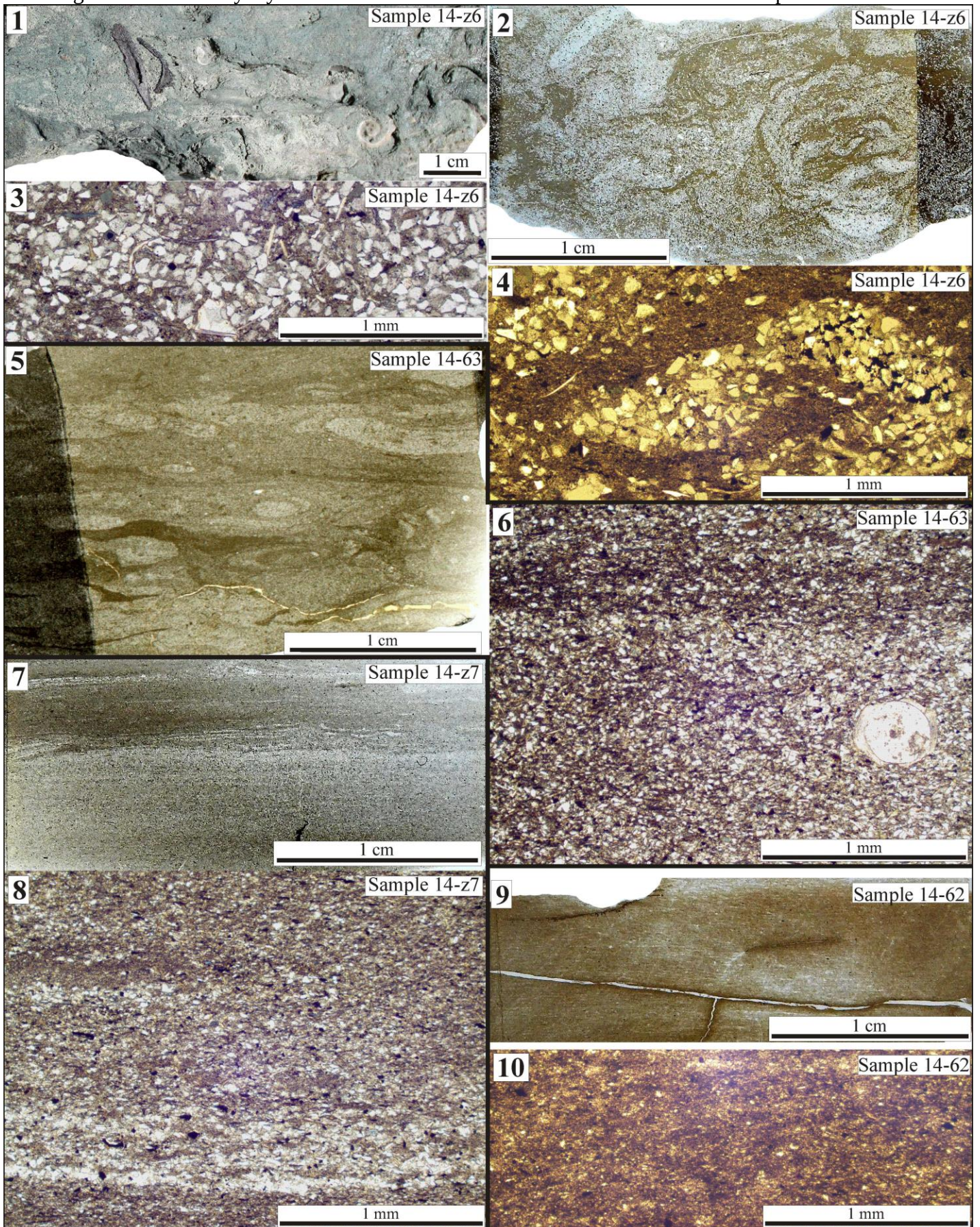


Table 5

Figs. 1–2. Gently wavy micro-layering with an erosion surface and deformation texture of intrusion in claystones. Sample 14-61.

Figs. 3–6. Poorly bioturbated argillite and silty argillite with gently wavy microlayered texture and deformation texture of intrusion. 3–4 – sample 14-60. 5–6 – sample 14-53.

Figs. 7–8. Siltstones with a gently inclined micro-cross-bedded texture. Sample 14-52.

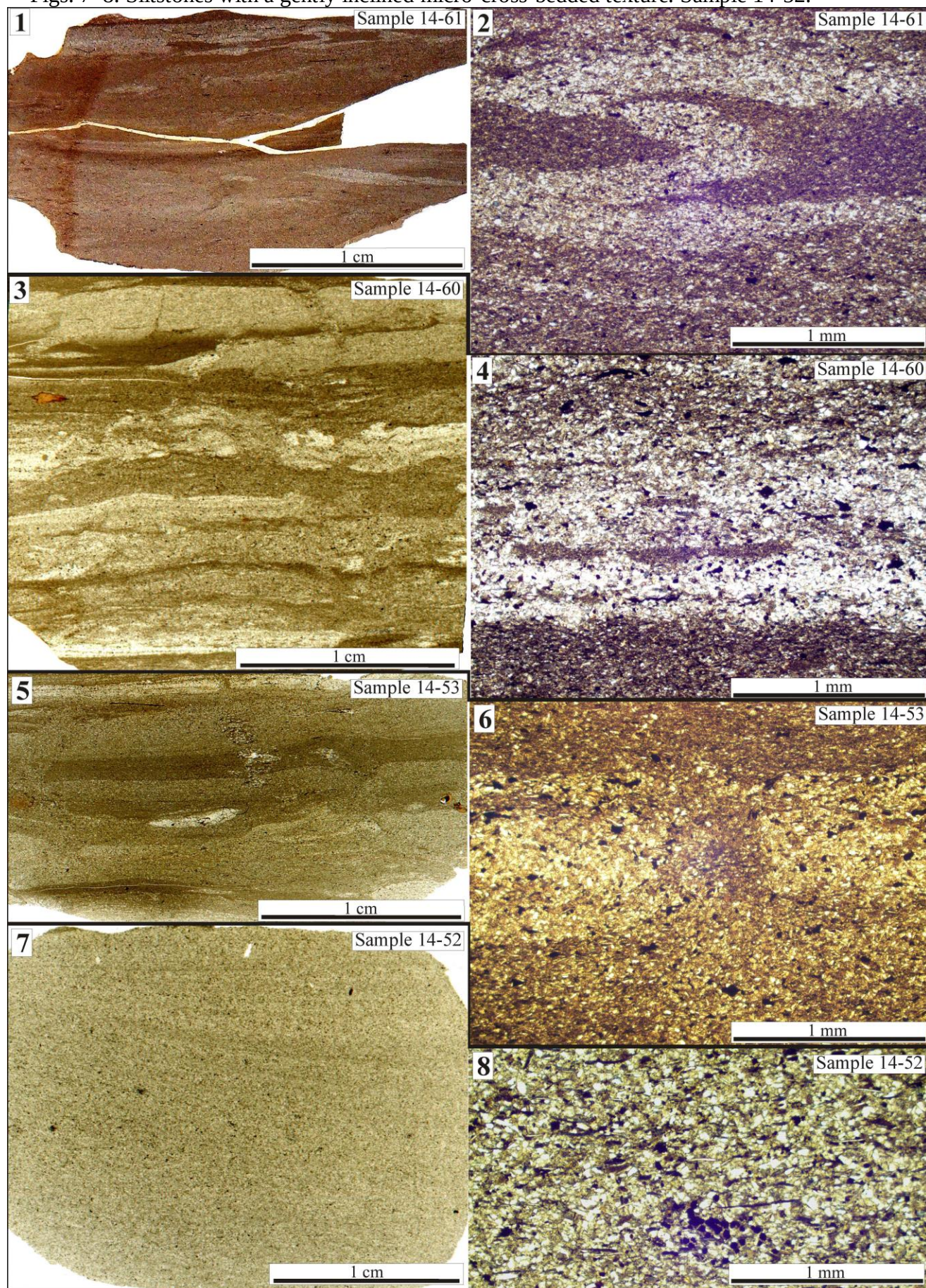


Table 6

Figs. 1–6. Microlayered and gently inclined micro-cross-bedded (Fig. 5) siltstones and mudstones: 1–2 – sample 14-51, 3–4 – sample 14-50, 5–6 – sample 14-49.

Figs. 7–8. Quartz sandstones with microlayered texture. Sample 14-47.

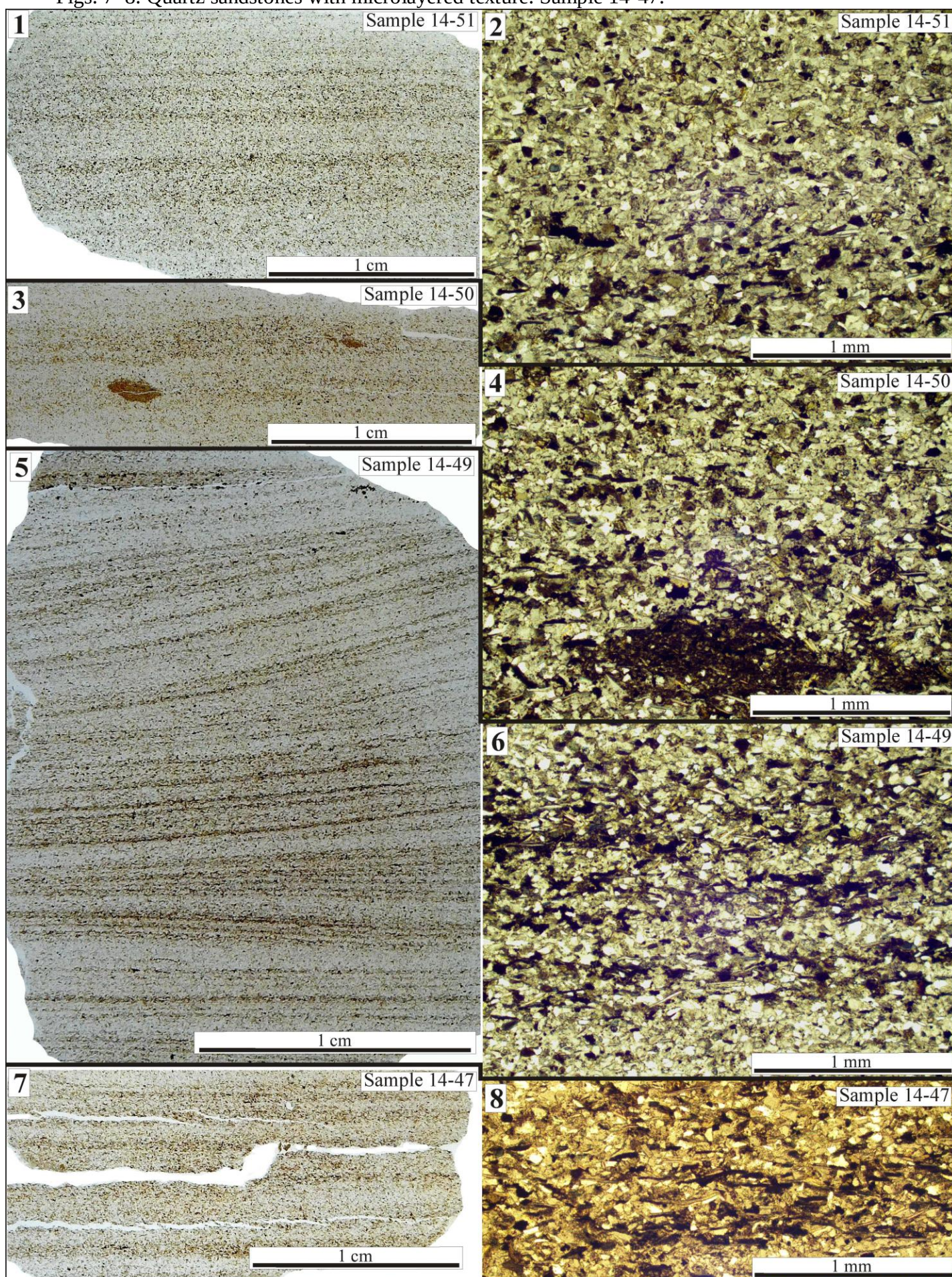


Table 7

Figs. 1–4. Poorly mixed sandy limestone and bioclastic limestone with intraclasts. Sample 14-46A.

Figs. 5–8. Sandy limestone with bioclastic. Sample 14-46.

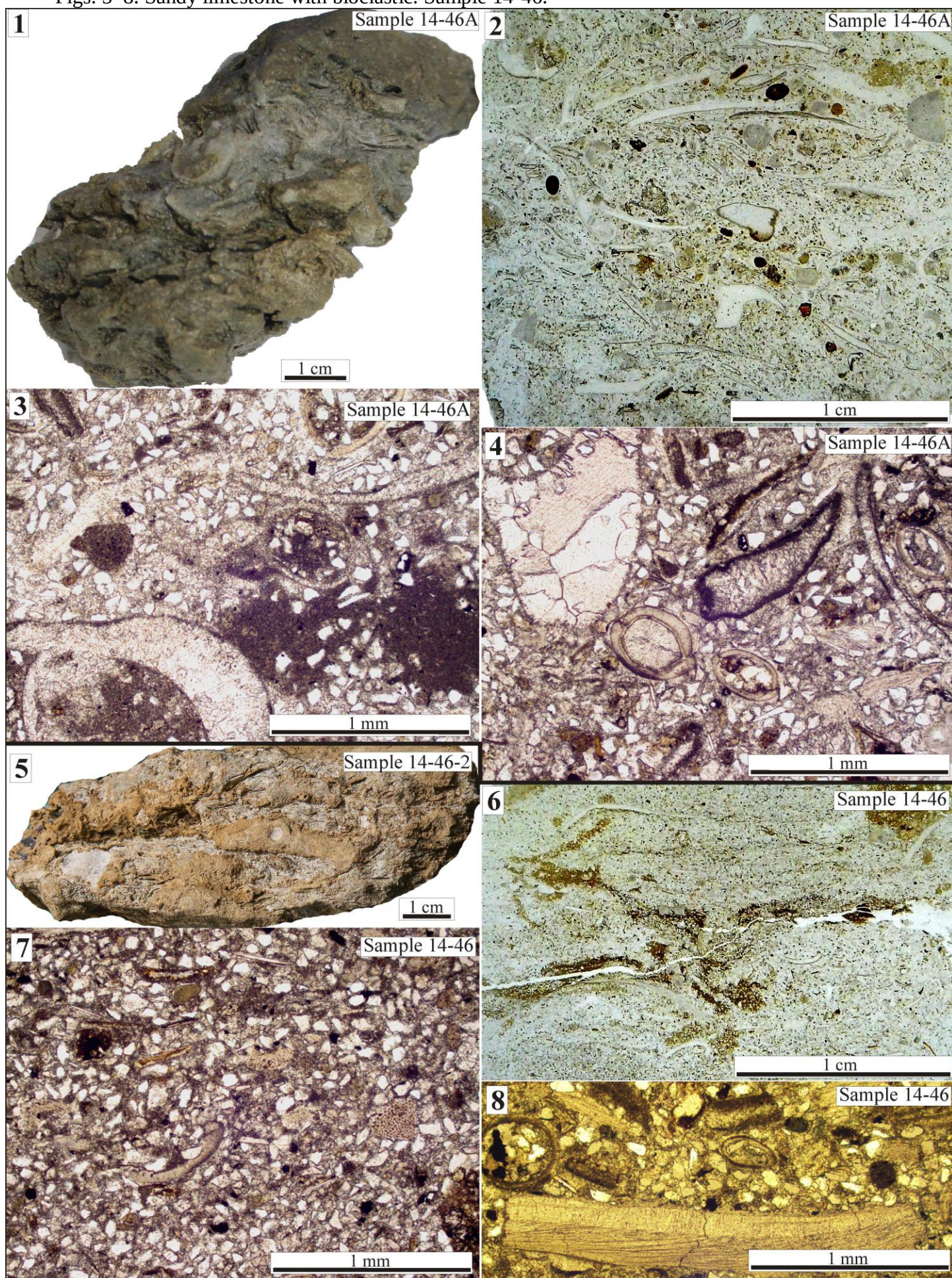


Table 8

Figs. 1–4. Microlayered and gently inclined micro-cross-bedded calcareous siltstones and mudstones: 1–2 – sample 14-45, 3–4 – sample 14-44.

Figs. 5–8. Siltstones with a finely wavy micro-laminated and gently inclined micro-cross-bedded texture, forming layers in argillites: 5–6 – sample 14-43, 7–8 – sample 14-42.

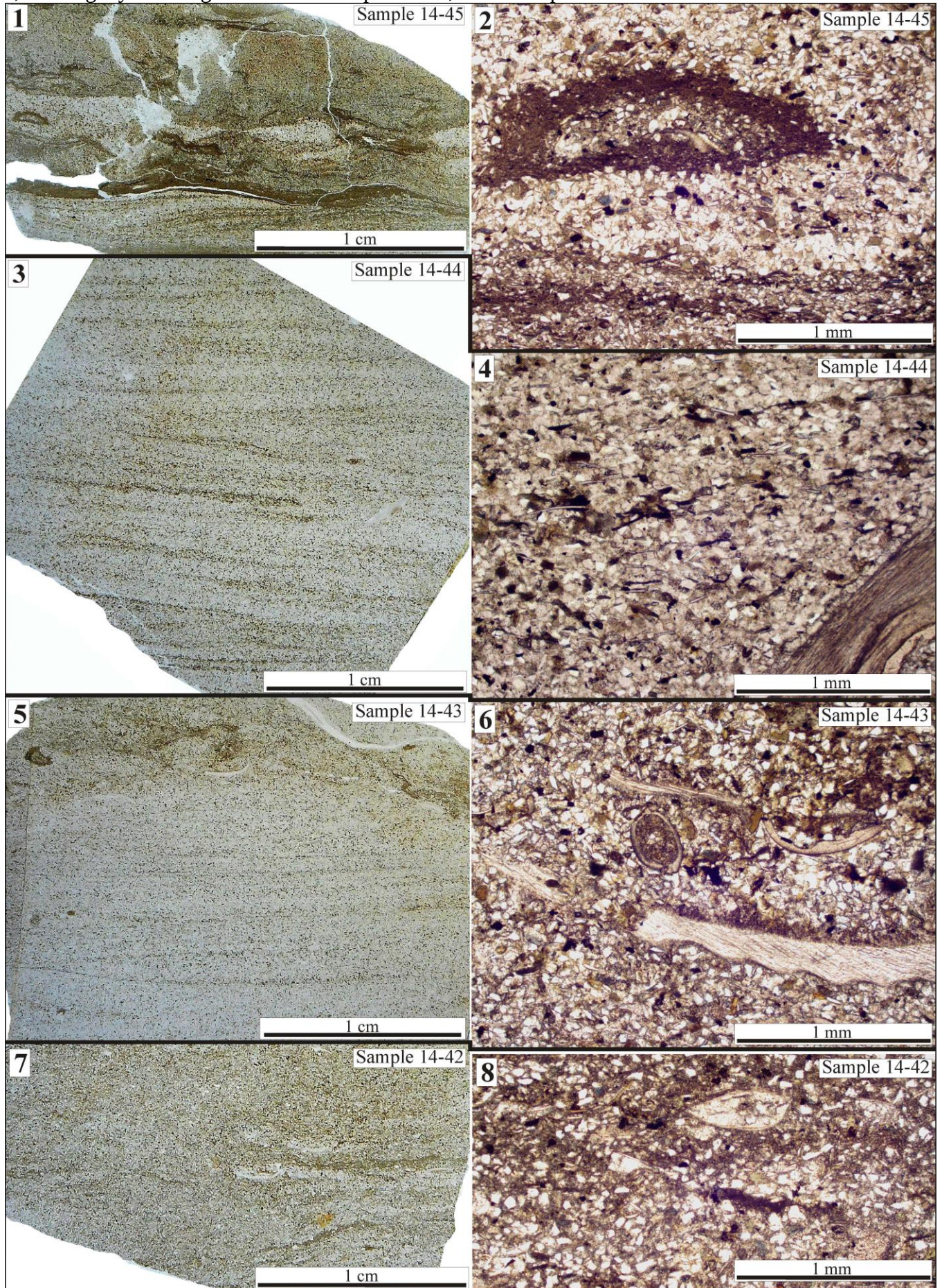


Table 9

Fig. 1–6. Poorly mixed sandy limestone and bioclastic limestone with intraclasts (Figs. 1–2): 1–2 – sample 14-41, 3–4 – sample 14-40, 5–6 – sample 14-39A.

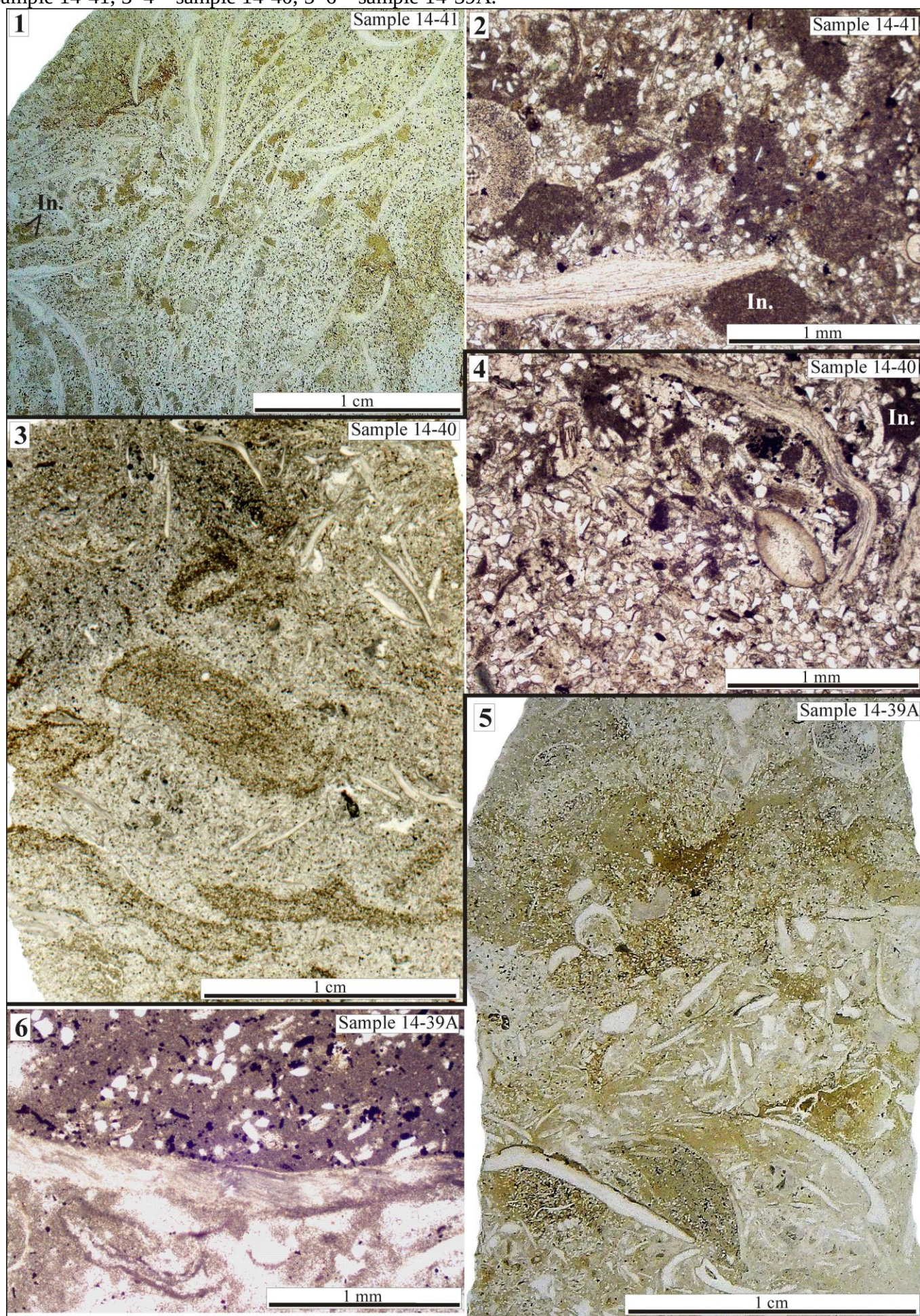


Table 10

Figs. 1–2. Bioturbated silty limestone. Sample 14-39.

Figs. 3–4. Peloidal-bioclastic limestone. Sample 14-38.

Figs. 5–6. Claystones with micro-layered texture. Sample 14-37.

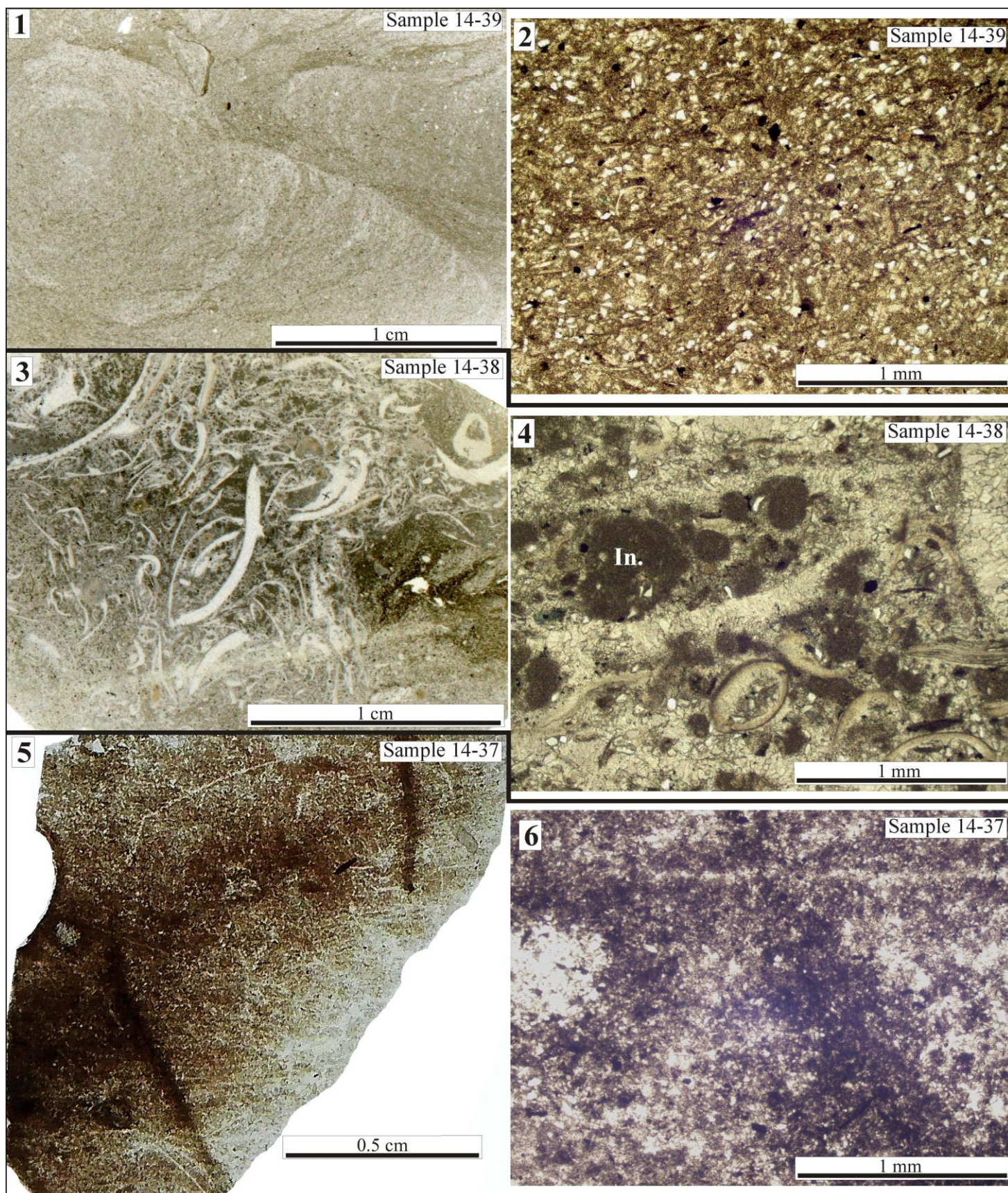


Table 11

Figs. 1–4. Peloidal-bioclastic limestone: 1–2 – sample 14-36, 3–4 – sample 14-35.

Figs. 5–6. Bioturbated silty limestone. Sample 14-33.

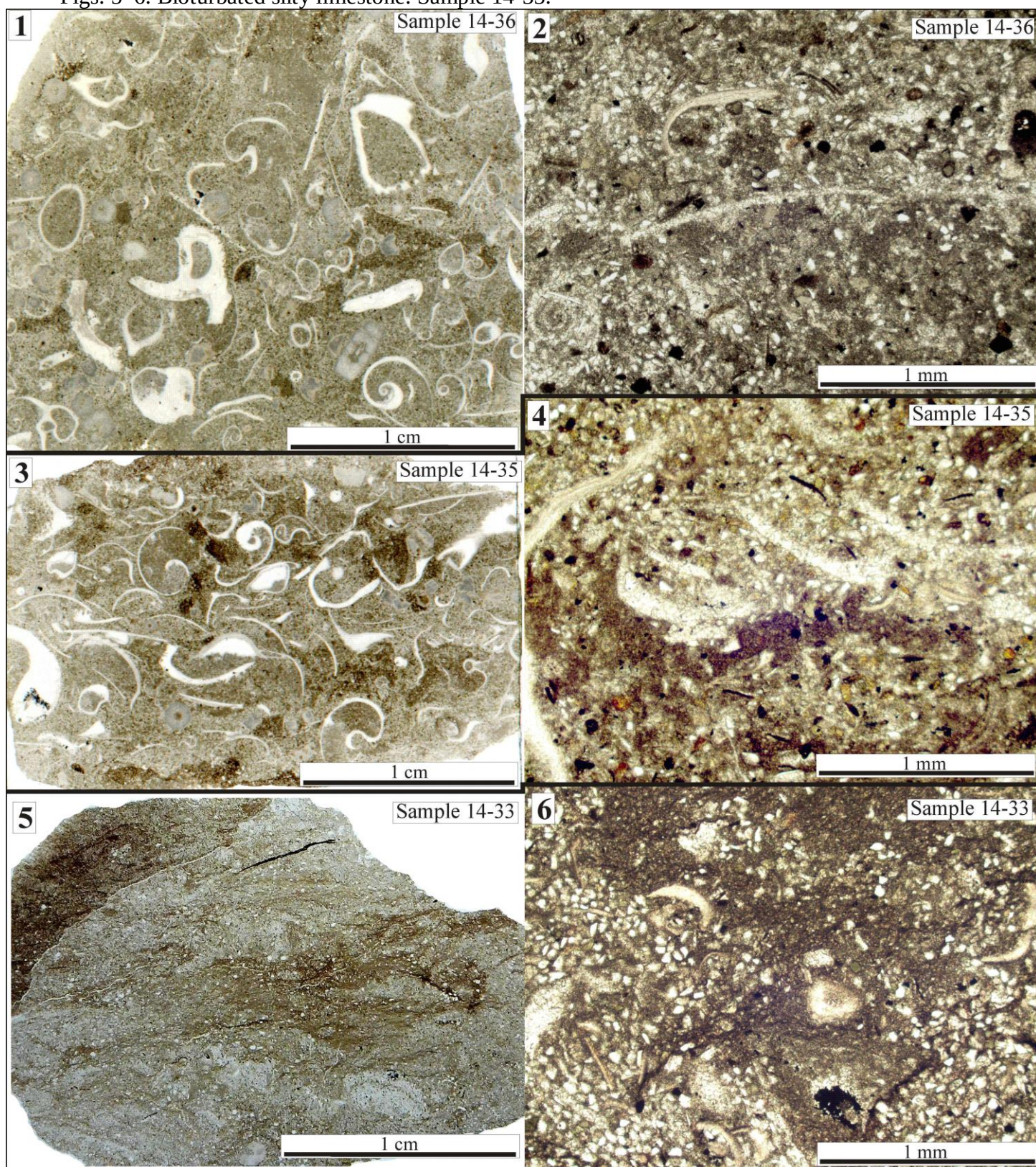


Table 12

Figs. 1–4. Bioturbated silty limestone. 1–2 – disparate shells, an ostracod with an ultra-thin shell wall, sample 14-32. 3–4 – sample 14-31.

Figs. 5–6. Conglobreccia, intraclasts of micro-layered silty limestones in calcareous mudstones. Sample 14-30.

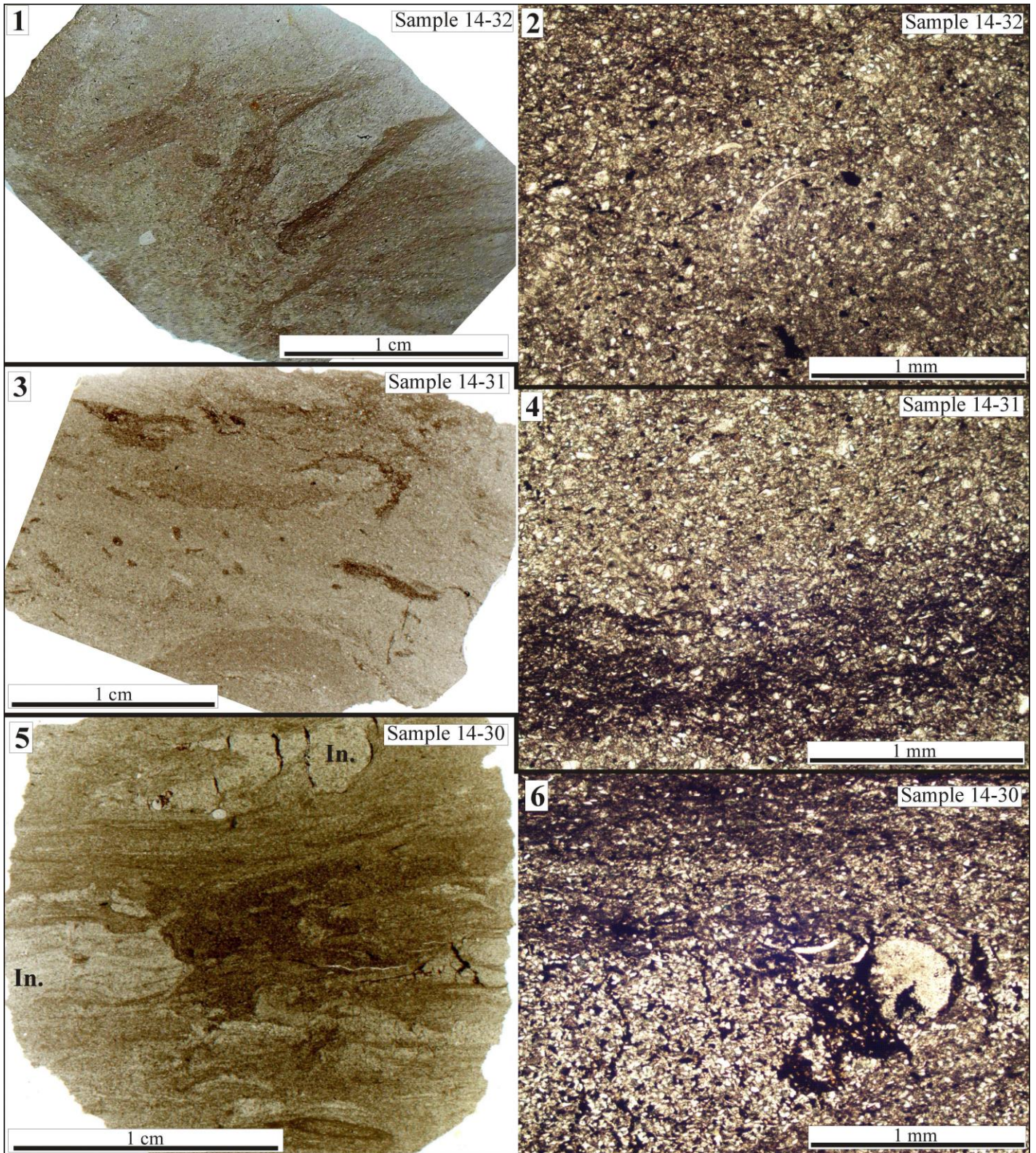


Table 13

Figs. 1–6. Calcareous mudstones. 1–2 – is a massive texture. Sample 14-29. 3–4 – bioturbation in micro-layered mudstones. Deformed burrows and postsedimentation micro-fault disturbances are observed. Sample 14-28. 5–6 – Traces of bioturbation. Sample 14-27.

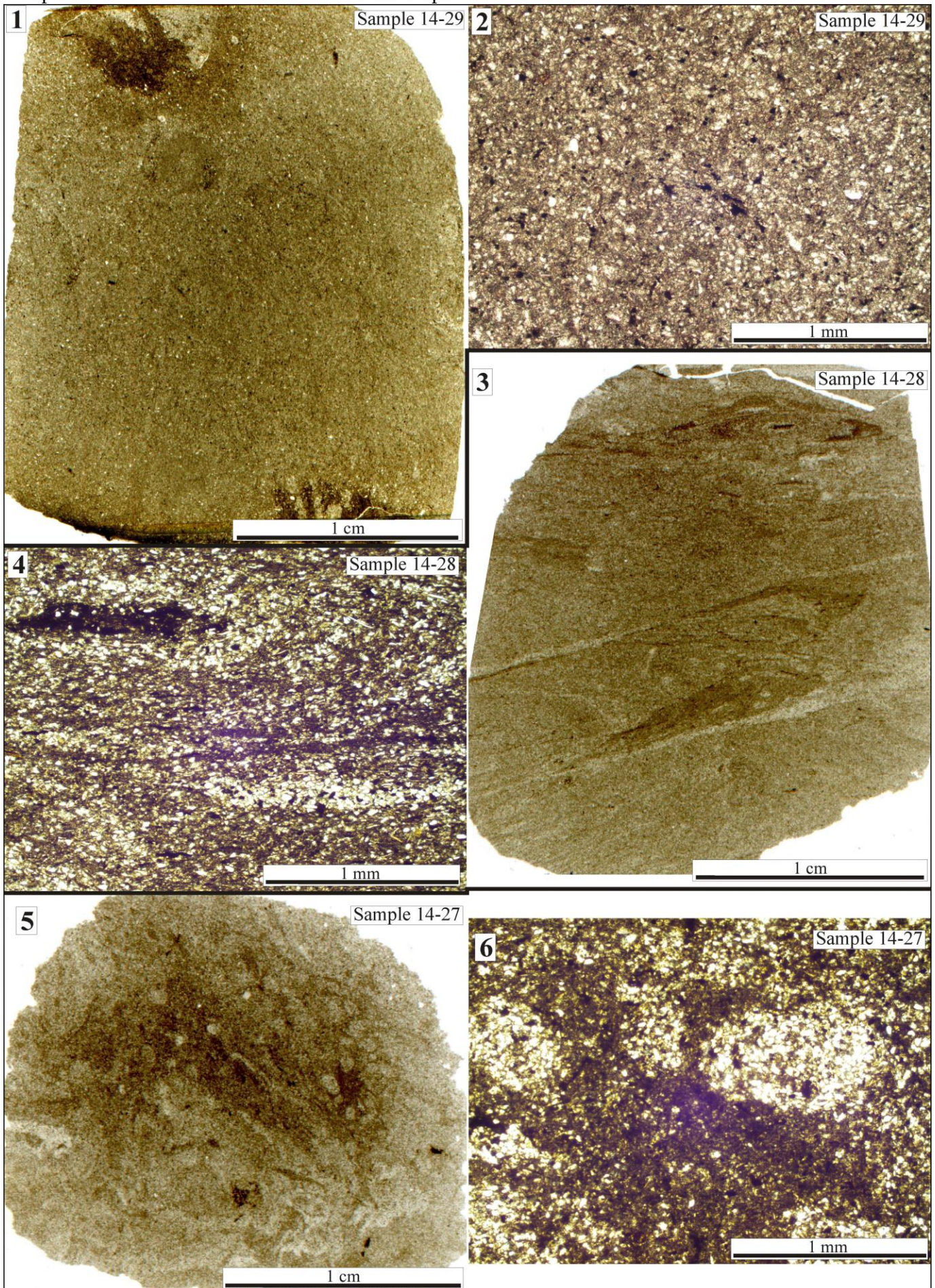


Table 14

Figs. 1–6. Intensively bioturbated clay limestones: 1–2 – sample 14-26, 3–4 – sample 14-25, 5–6 – sample 14-23.

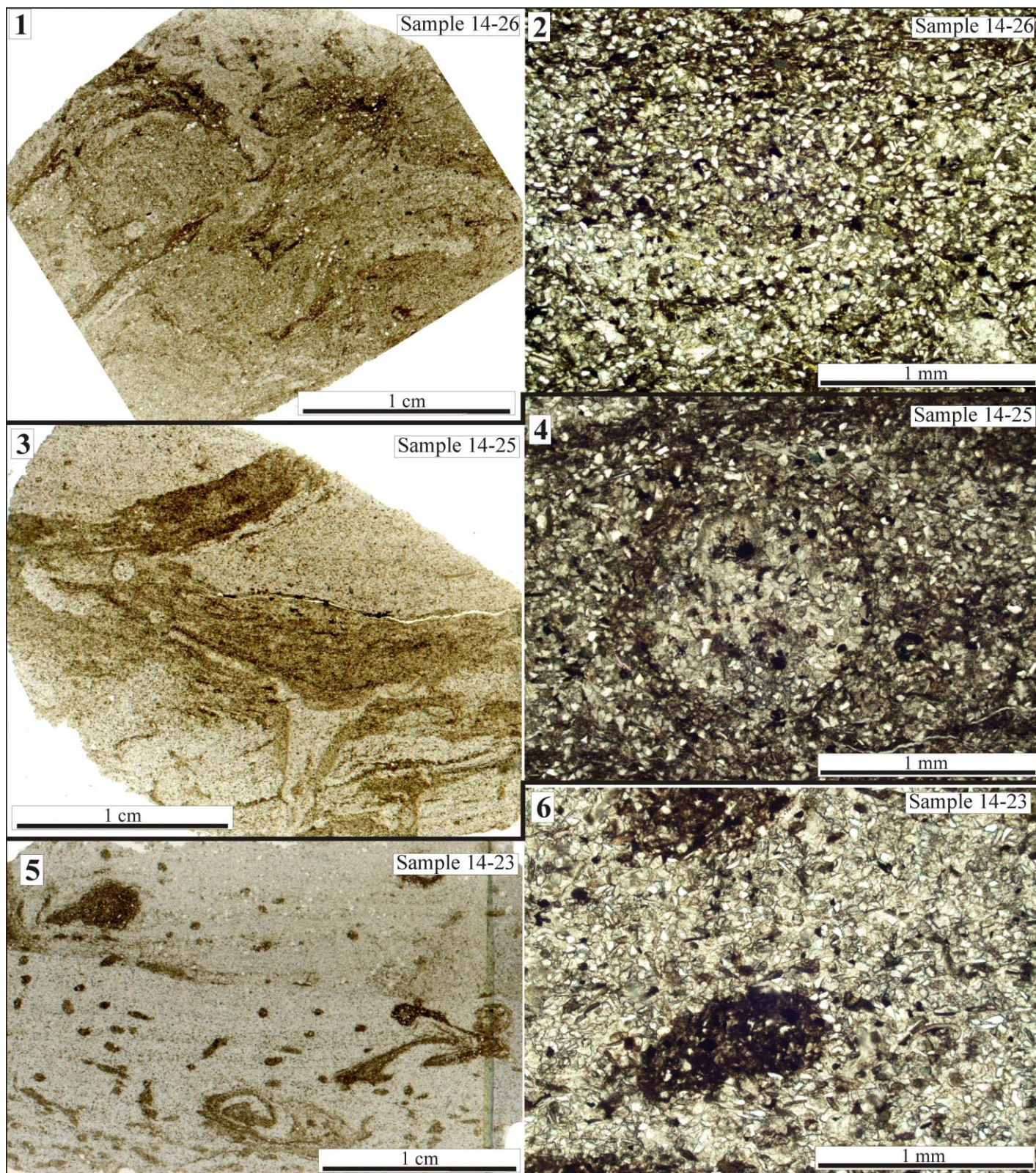


Table 15

Figs. 1–2. Bioturbated silty limestone with microlayered texture. Sample 14-22.

Figs. 3–4. Bioturbated silty and sandy limestones. Sample 14-21.

Figs. 5–6. Bioturbated fine-grained quartz sandstone. Sample 14-20.

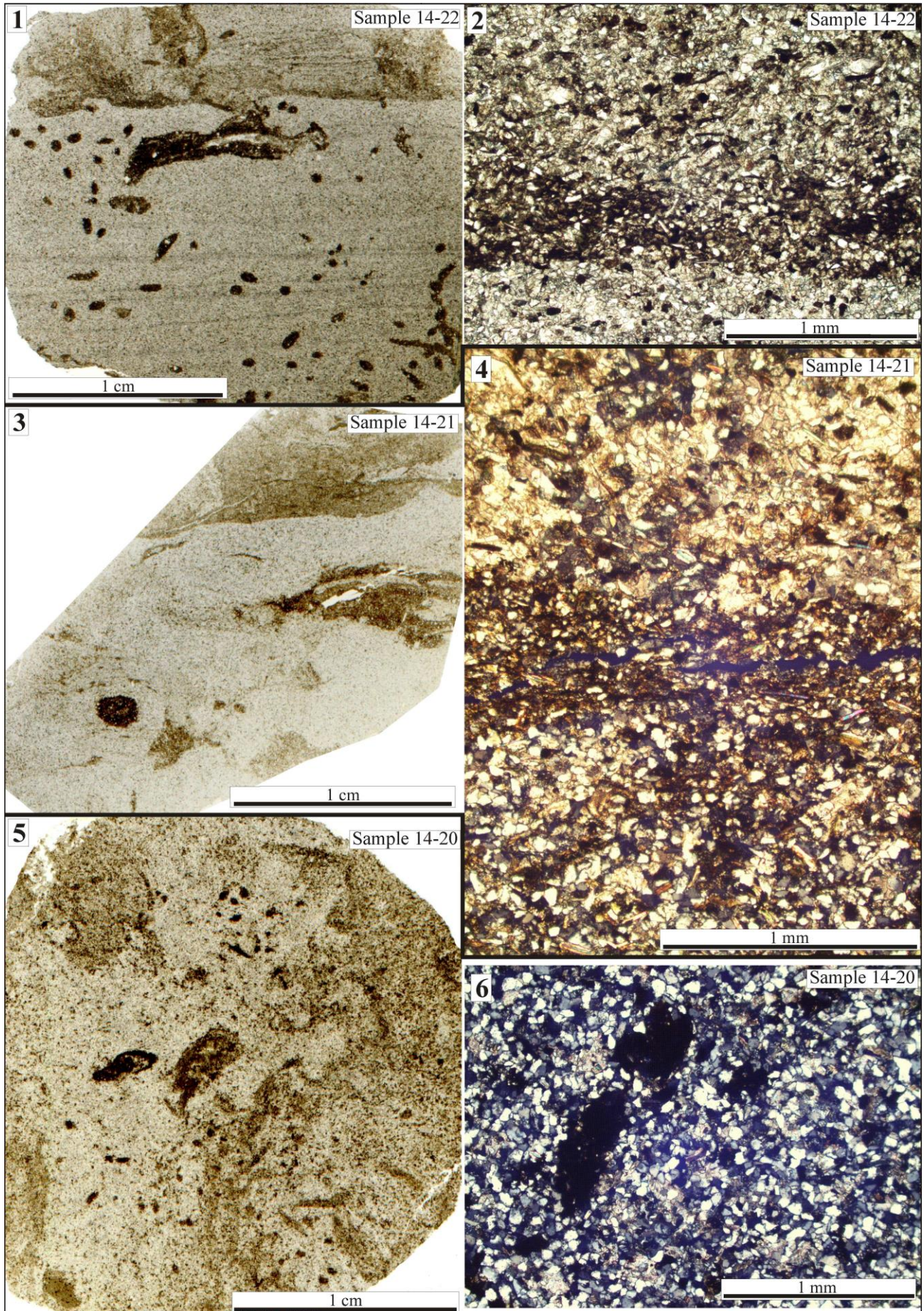


Table 16

Figs. 1–2. Bioturbated fine-grained quartz sandstone with deformational textures of intrusion and cracking? (conglobreccia?). Sample 14-19.

Figs. 3–5. Intensively bioturbated sandy limestone. Sample 14-18.

Figs. 6–7. Claystones with indistinctly developed deformation textures. Sample 14-18A.

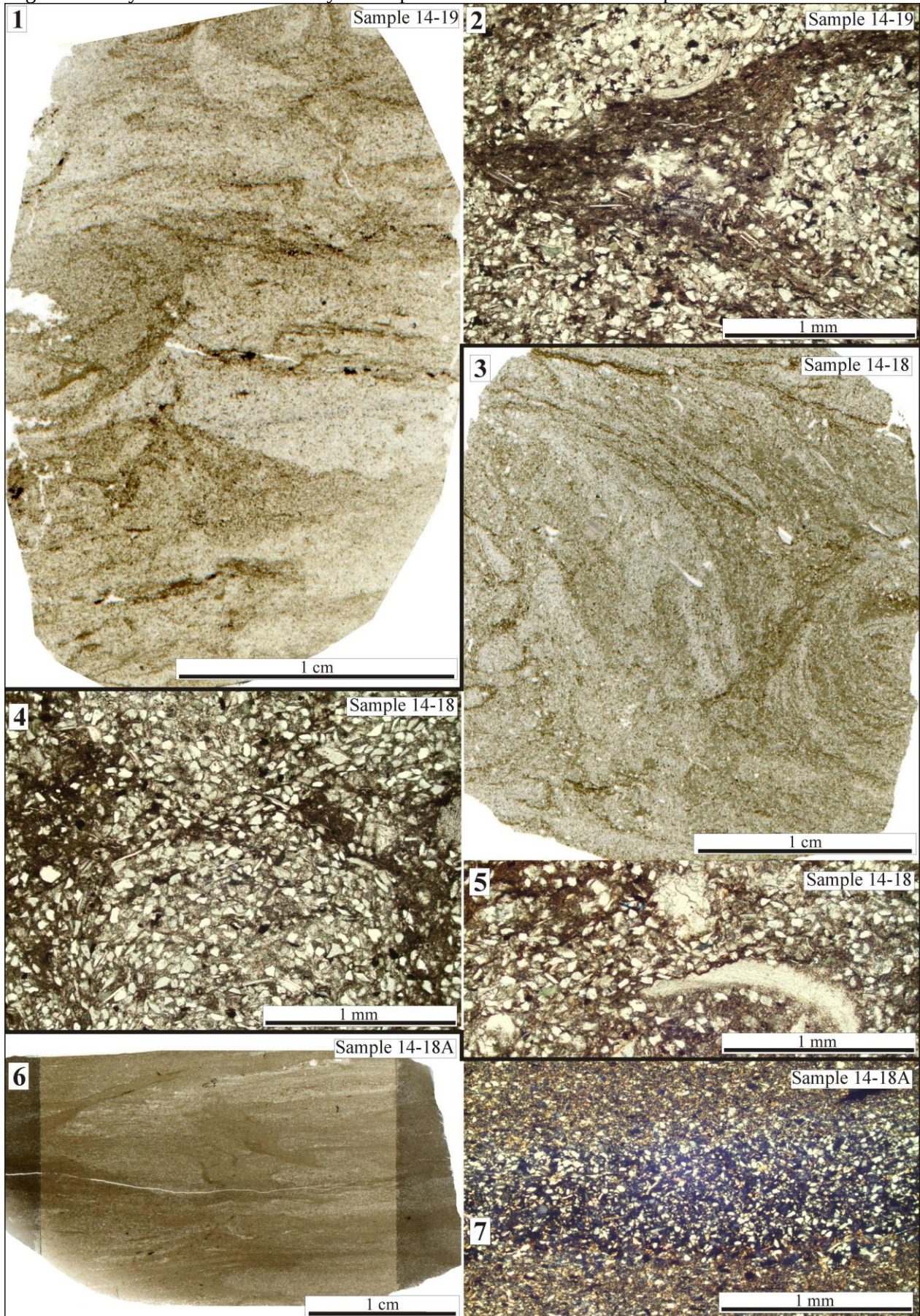


Table 17

Figs. 1–6. Claystones with deformation textures? 1–2 – sample 14-17, 3–4 – sample 16-16, 5–6 – traces of burrowing organisms, Sample 16-15.

Figs. 7–8. Deformation textures of intrusion in microlayered calcareous siltstones and mudstones. Sample 14-14.

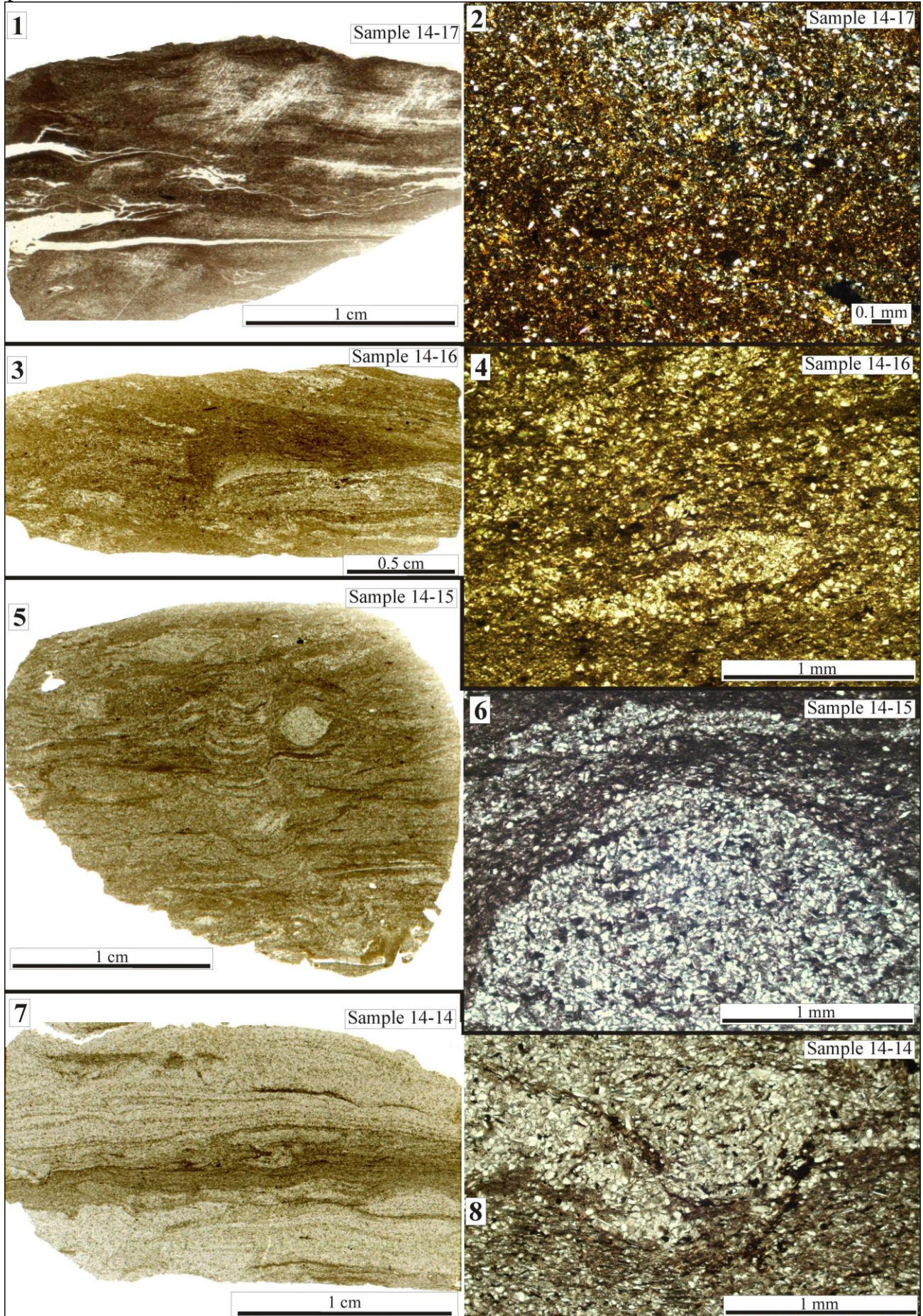


Table 18

Figs. 1–2. Bioturbated sandy limestones. Sample 14-14a.

Figs. 3–5. Conglobreccia, intraclasts of microlayered sandy limestones in calcareous argillites. Sample 14-13.

Figs. 6–8. Bioturbated sandy siltstones. Sample 14-13a.

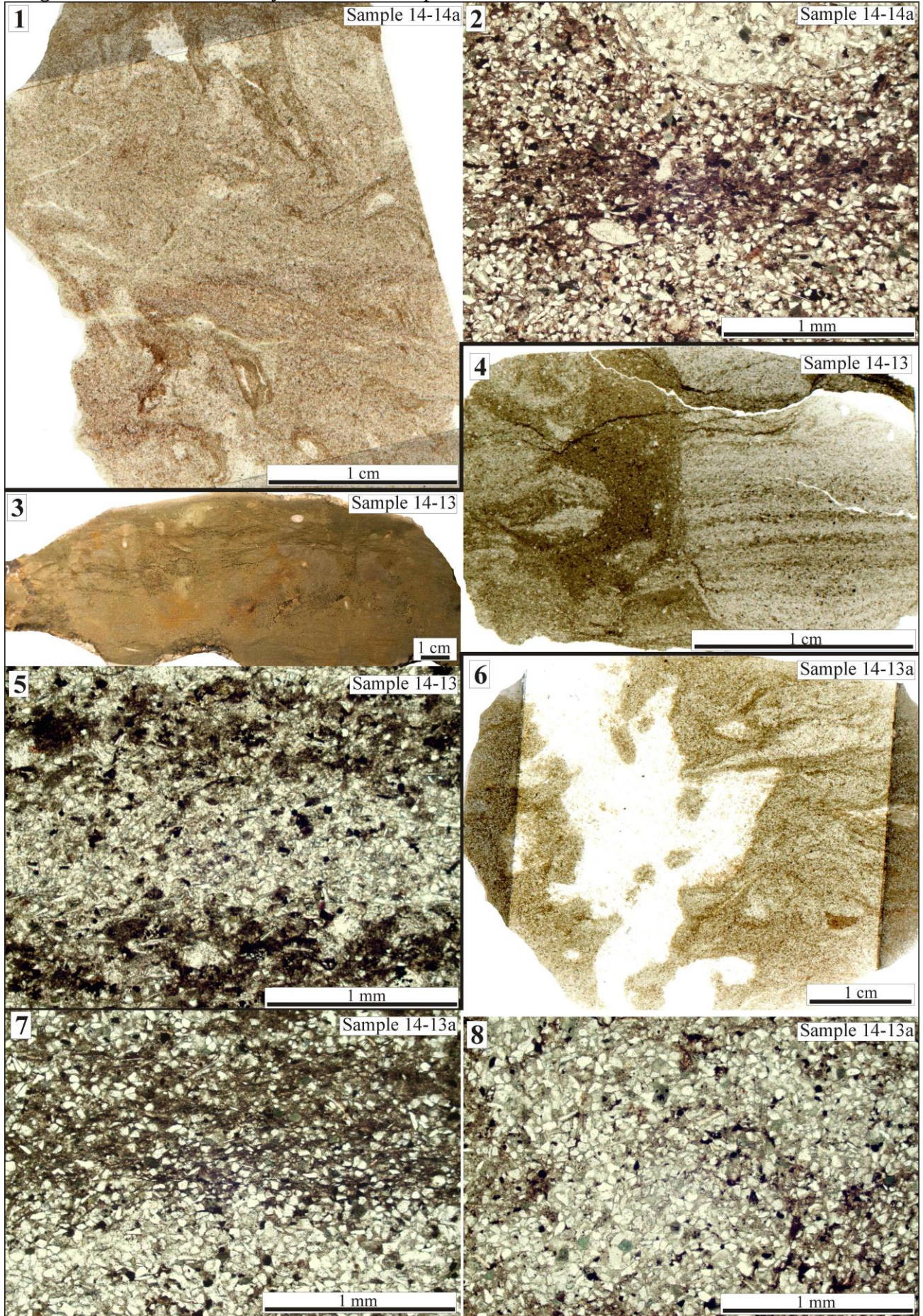


Table 19

Figs. 1–3. Bioturbated silty and sandy limestones. Sample 14-12.

Figs. 4–5. Bioturbated sandy limestones. Sample 14-11a.

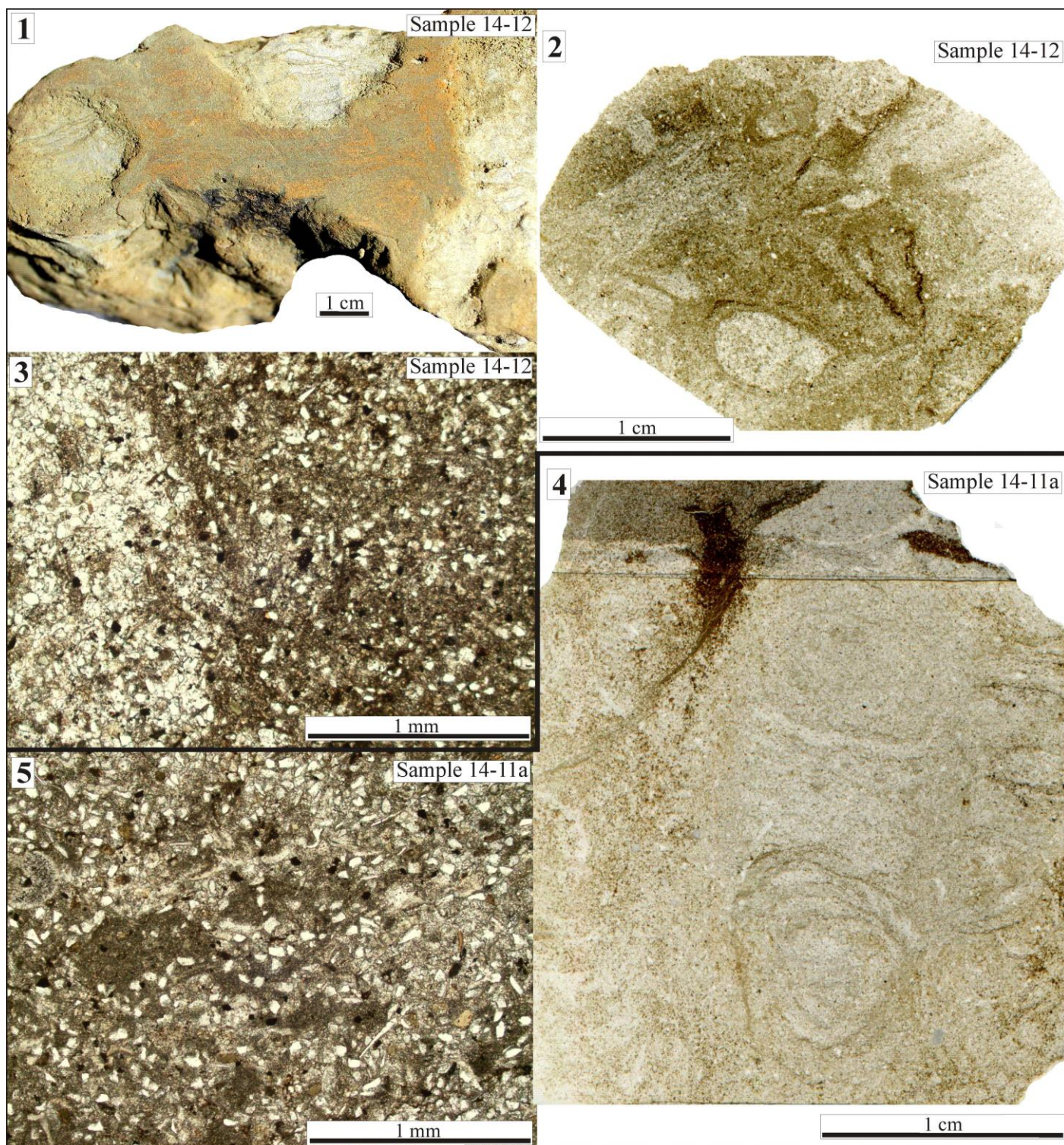


Table 20

Figs. 1–7. Bioturbated clayey-sandy limestones. Terrigenous quartz of fine-to-medium grain size is unevenly distributed throughout the rock. Bioclasts are mainly represented by brachiopods. Figs. 1–3, Sample 14-10; Figs. 4–6, Sample 14-10b; Fig. 7, Sample 14-10a.

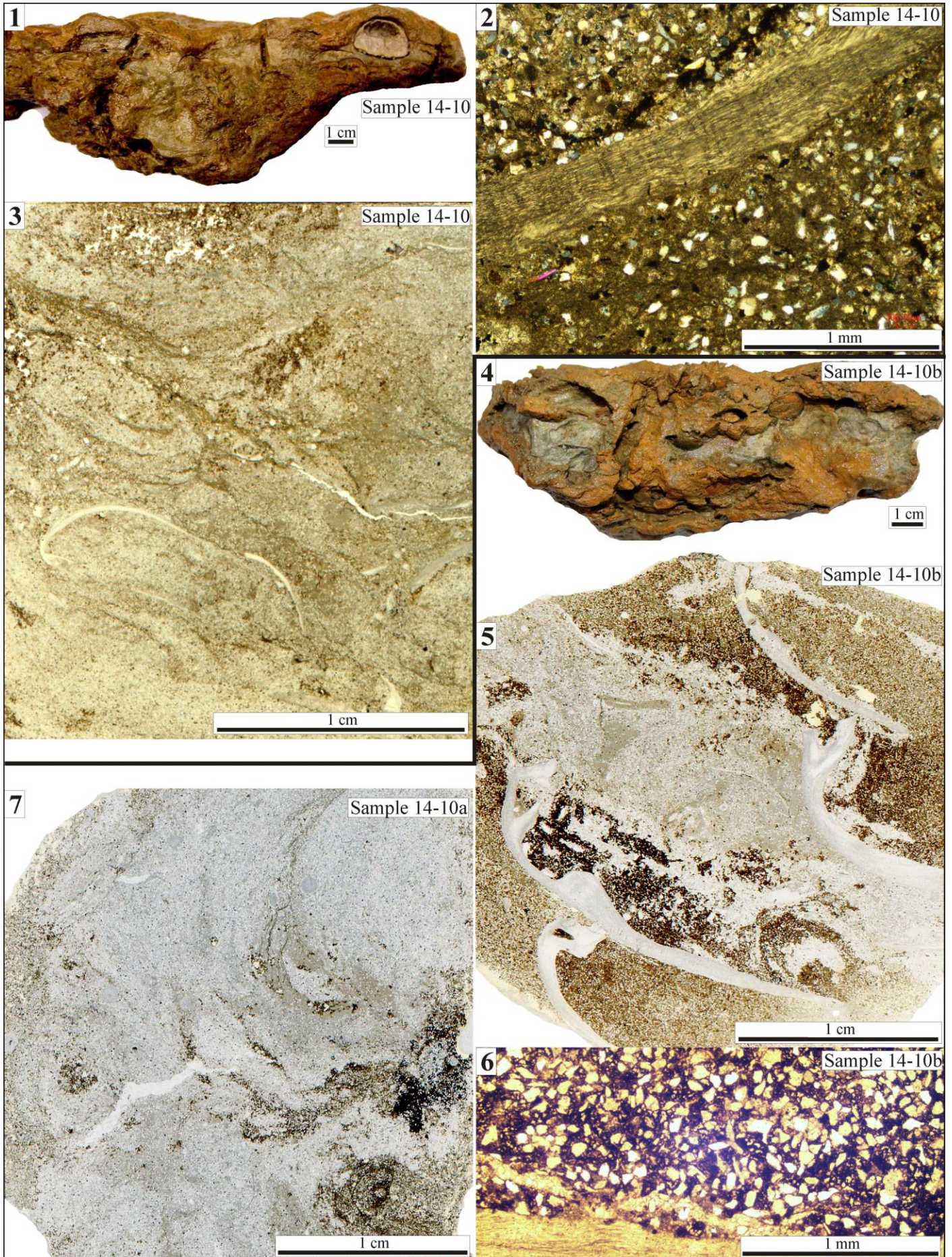
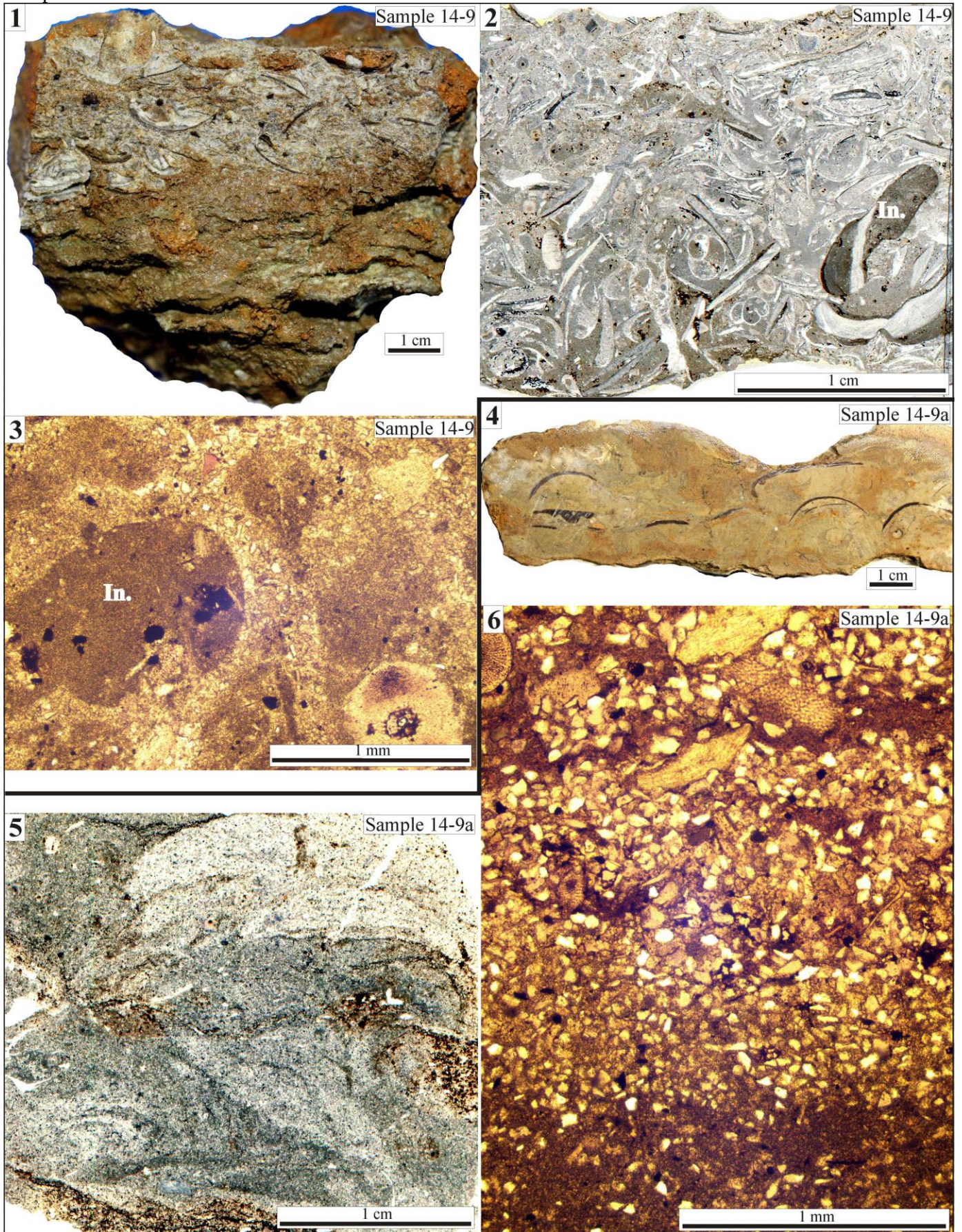


Table 21

Figs. 1–3. Bioturbated clayey-sandy limestones with rare gravel-sized lithoclasts. Terrigenous quartz is unevenly distributed throughout the rock. Coarse-grained bioclasts are represented by fragments of brachiopods, gastropods, and crinoids. Sample 14-9.

Figs. 4–6. Bioturbated clayey-sandy limestones with rare brachiopods and crinoids bioclasts. Terrigenous quartz is unevenly distributed in the rock, often filling the burrows of burrowing organisms. Sample 14-9a.



Supplementary S2, b

Atlas of textures and structures (Upper Ust-Yarega Subformation)

Ukhta River, Outcrop 14; Tables 1–5.

Ukhta River, Outcrop 14C; Table 5, Figs. 3–5.

Yarega River, Outcrop 16R; Table 5, Figs. 6–9.

Yarega River, Outcrop 16; Tables 6–21.

Chut River, Outcrop C1242; Tables 22–29.

Chut River, Outcrop 7; Tables 30–36.

Table 1

Figs. 1–3. Hard ground horizon. Mudstone is overlain by packstones containing rare intraclasts. The coarse-grained bioclasts are composed of fragments of brachiopods, bivalves, gastropods, and crinoids. The intraclasts are composed of mud-wackstones. Sample 14-8.

Figs. 4–5. Packstones contain an admixture of fine-grained quartz sand. Coarse-grained bioclasts are represented by fragments of brachiopods, gastropods, and crinoids. Sample 14-7.

Figs. 6–7. Mineralized crust along the burrows of burrowing organisms in wackstones. Bioclasts of coarse- to large-grained size are represented by fragments of brachiopods, gastropods, and crinoids. Sample 14-6.

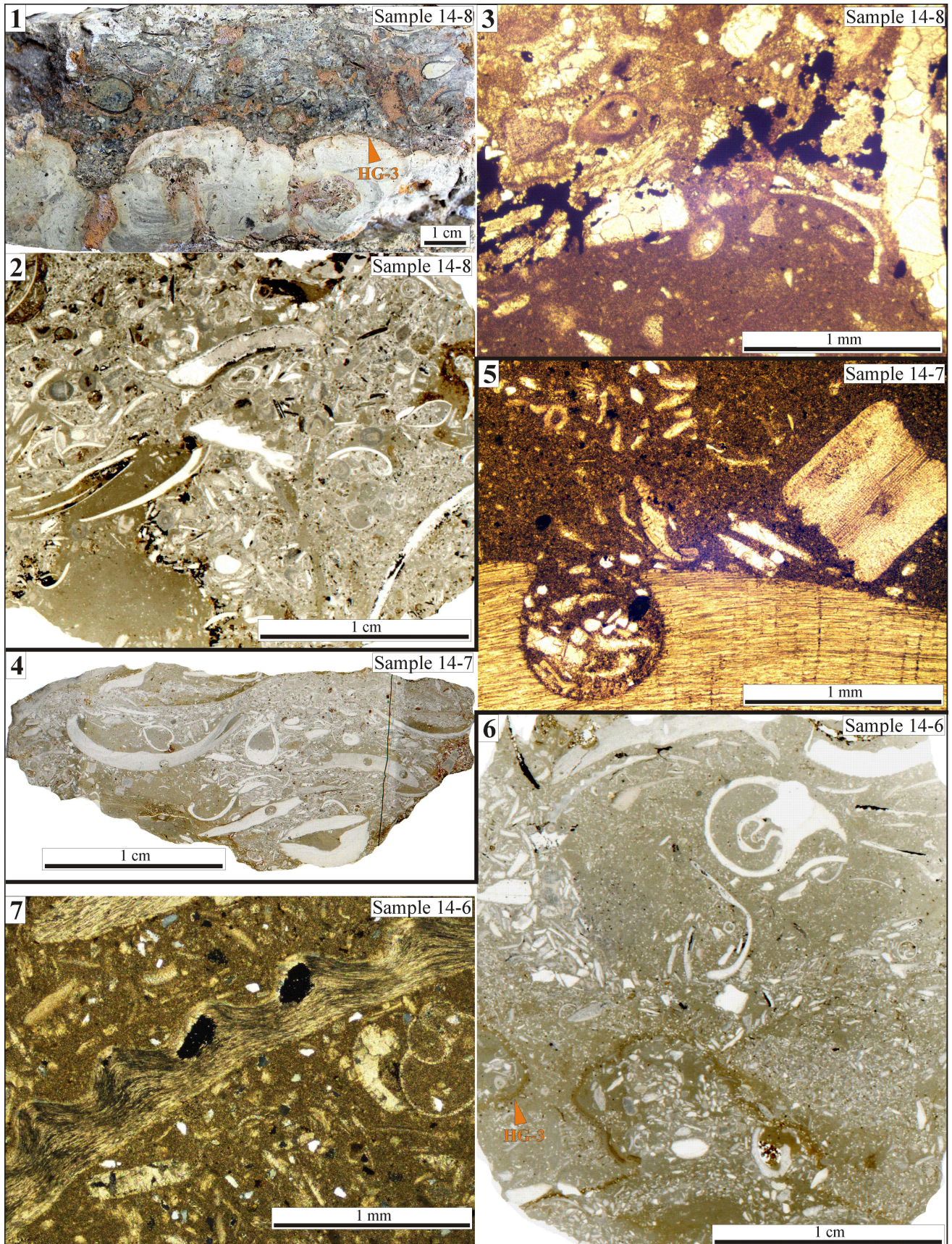


Table 2

Figs. 1–3. Bioturbated packstones with rare gravel-sized intraclasts. The bioclasts are the size of coarse sand. Sample 14-4.

Figs. 4–7. Bioturbated packstones. Some crinoid segments are replaced by glauconite. Figs. 4, 5, Sample 14-2; Figs. 6, 7, Sample 14-1f,g.

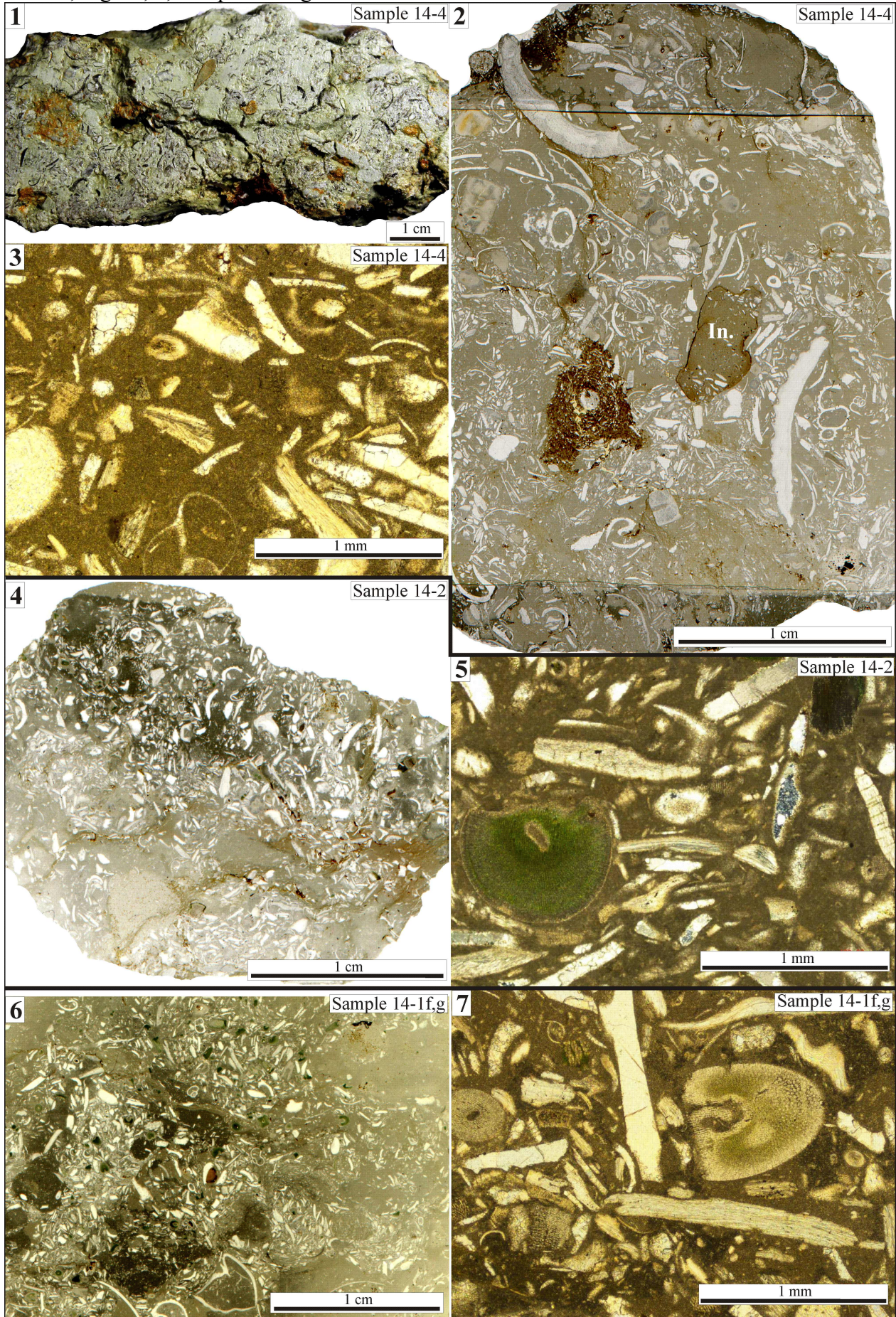


Table 3

Figs. 1–2. Bioturbated packstones with rare gravel-sized intraclasts. Bioclasts are predominantly coarse- to large-grained sand. The intraclasts are composed of mudstones. Sample 14-1e.

Figs. 3–4. Bioturbated packstones. Bioclasts are predominantly coarse-sand-sized. Sample 14-1d.

Figs. 5–6. Bioturbated mudstones with surfaces of the hard ground preserved from erosion. Bioclasts are predominantly coarse-grained sand. Sample 14-1c.

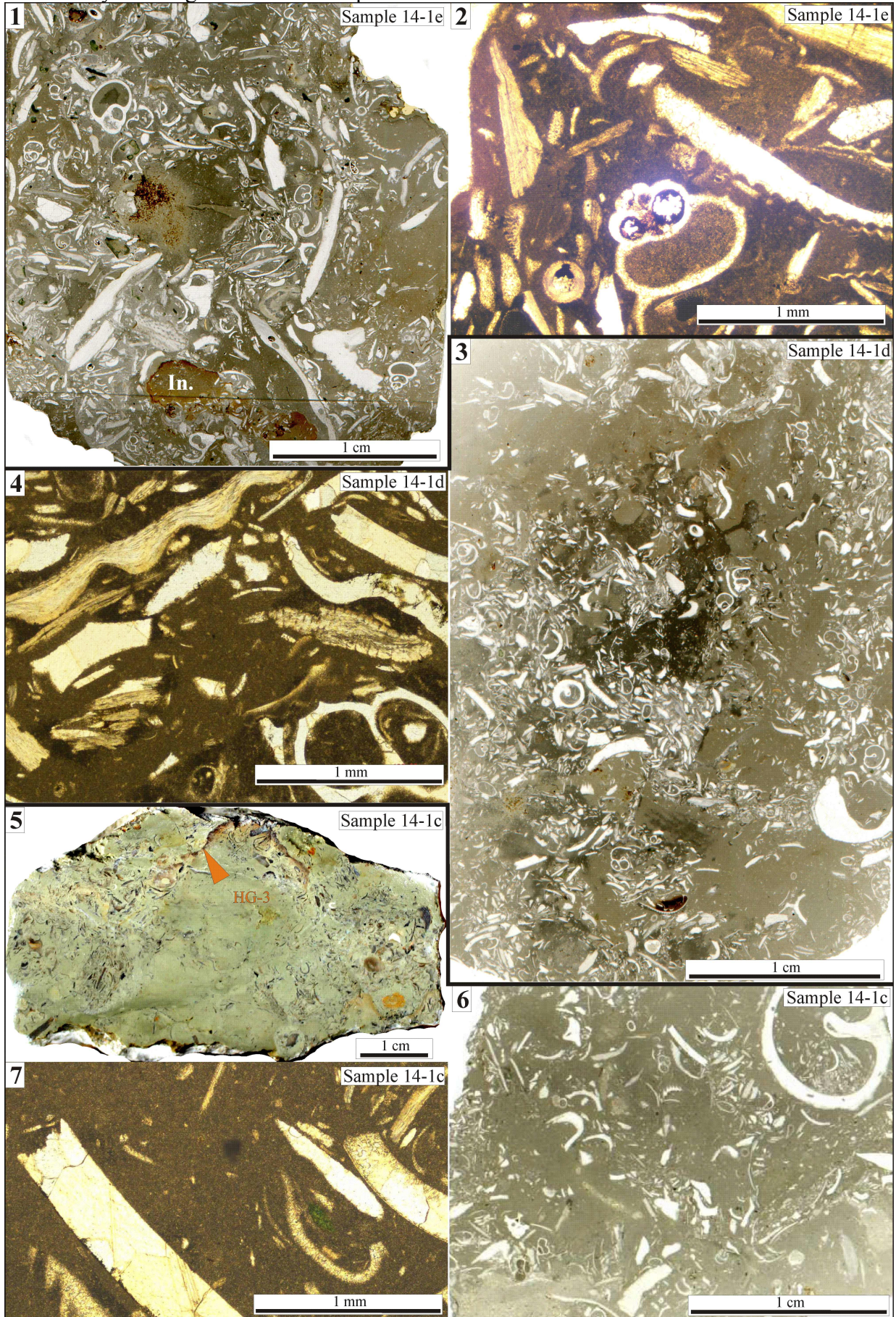


Table 4

Figs. 1–3. Hard ground horizon in bioturbated mud- wackestones. Bioclasts, predominantly coarse-grained, are represented by fragments of brachiopods, bivalves, gastropods, and crinoids. Sample 14-1b.

Figs. 4–5. Bioturbated wackestones. Bioclasts, predominantly coarse-grained, are represented by fragments of brachiopods and gastropods shells. Sample 14-1a

Figs. 6–9. A hard ground horizon in bioturbated mud-wackestones. These are overlapped by bioturbated wackestones containing rare gravel-sized intraclasts of mudstones. The isometric shape of the intraclasts suggests that the underlying sediments were semi-lithified and eroded. Sample 14-1.

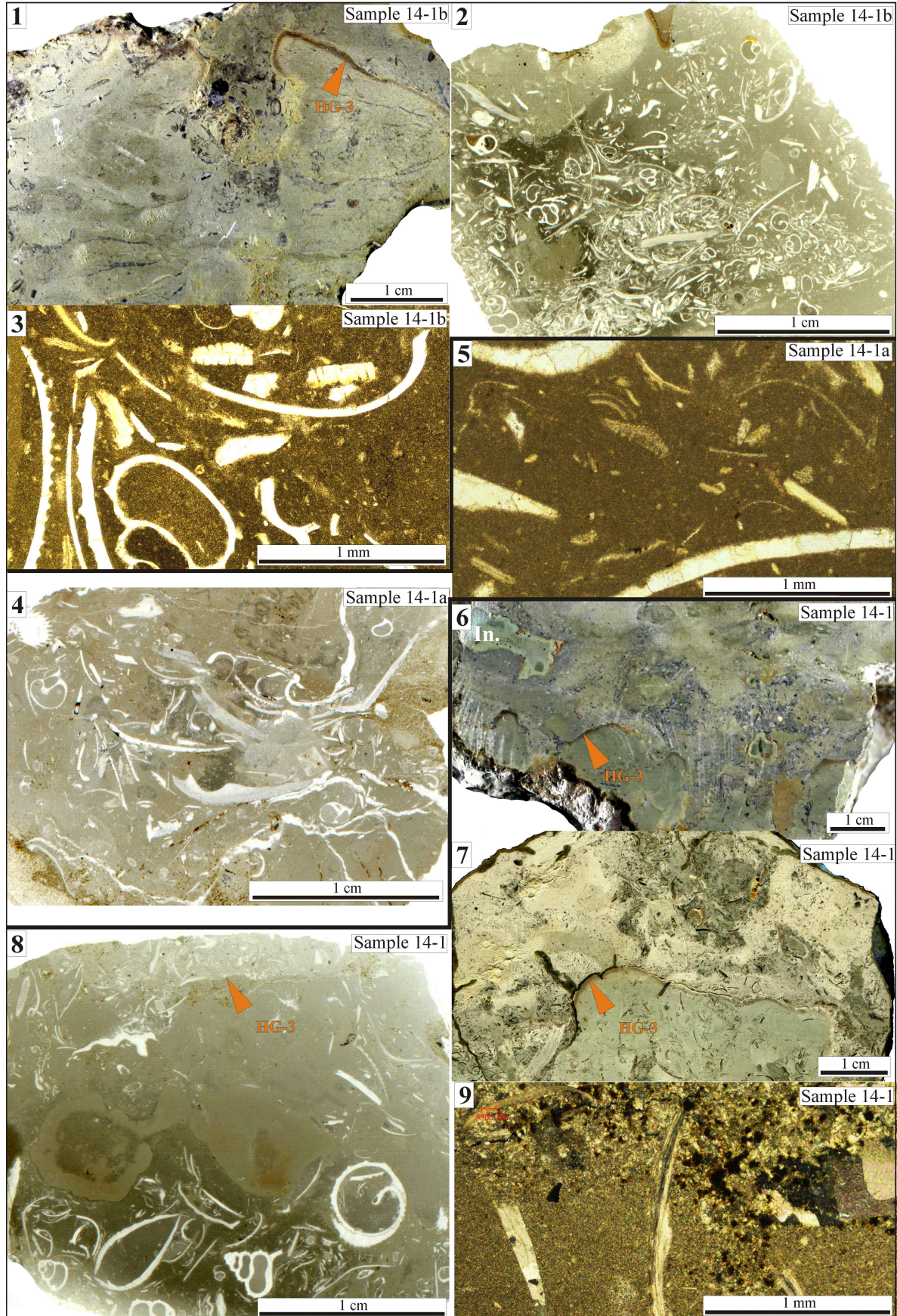


Table 5

Figs. 1–2. Concretion of bioturbated mudstone covered with bioclastic material (packstones). The burrows are also filled with bioclastic material (wacke-packstones). Sample 14-0.

Figs. 3–5. A layer of nodular, bioturbated mud-wackestones in the immature stage (incipient hardgrounds) of the emerging hard ground horizon (HG-2), covered by packstones on the erosion surface. Sample 14C-00.

Figs. 6–9: Bioturbated mud-wackestones. Bioclasts are predominantly coarse-grained and fill burrows. They consist of fragments of brachiopods and gastropods shells, as well as crinoids segments. Some crinoids have been replaced by glauconite. Figs. 6–7, Sample 16R-1; Figs. 8–9, Sample 16R-2.

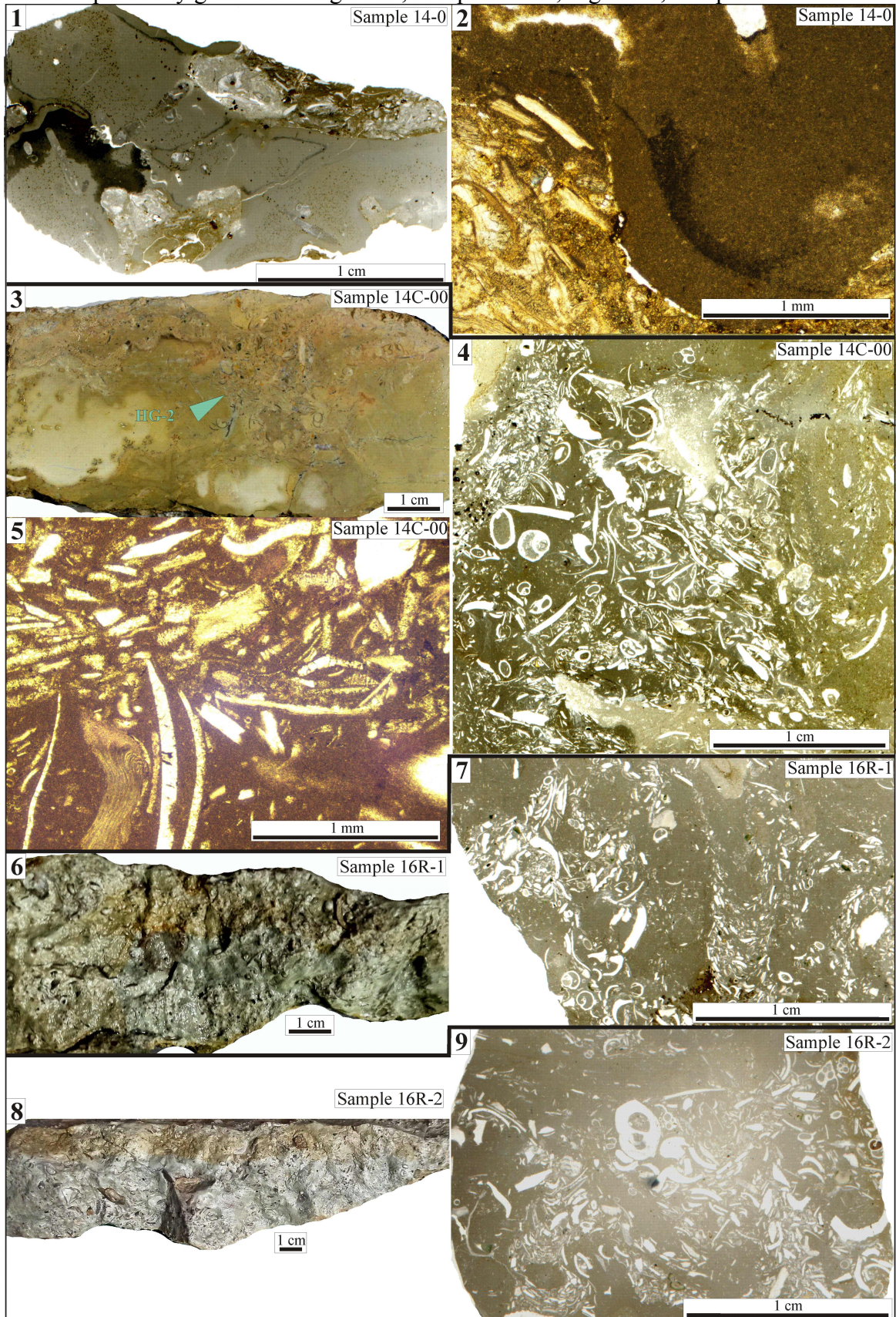


Table 6

Figs. 1–3. A layer of nodular, bioturbated mudstones in the immature stage of the nascent hard ground horizon (HG-2). The transition from isolated nodules to semi-continuous and continuous layers is visible. Sample 16-31.

Figs. 4, 7, 8. The erosion surface along the nascent hard ground horizon (HG-2) is covered in well-rounded limestone gravel with a clay-carbonate filling. Fig. 4, Sample 16-31/32; Figs. 7–8, Sample 16-32.

Figs. 5–6. The pseudo-gravelites/conglomerates (HG-1) formed in situ without the transportation of the incipient mudstone nodules (HG-0). This occurred due to the washing out of the host clay matrix and its replacement by a coarser clayey-bioclastic matrix. Sample 16-32.

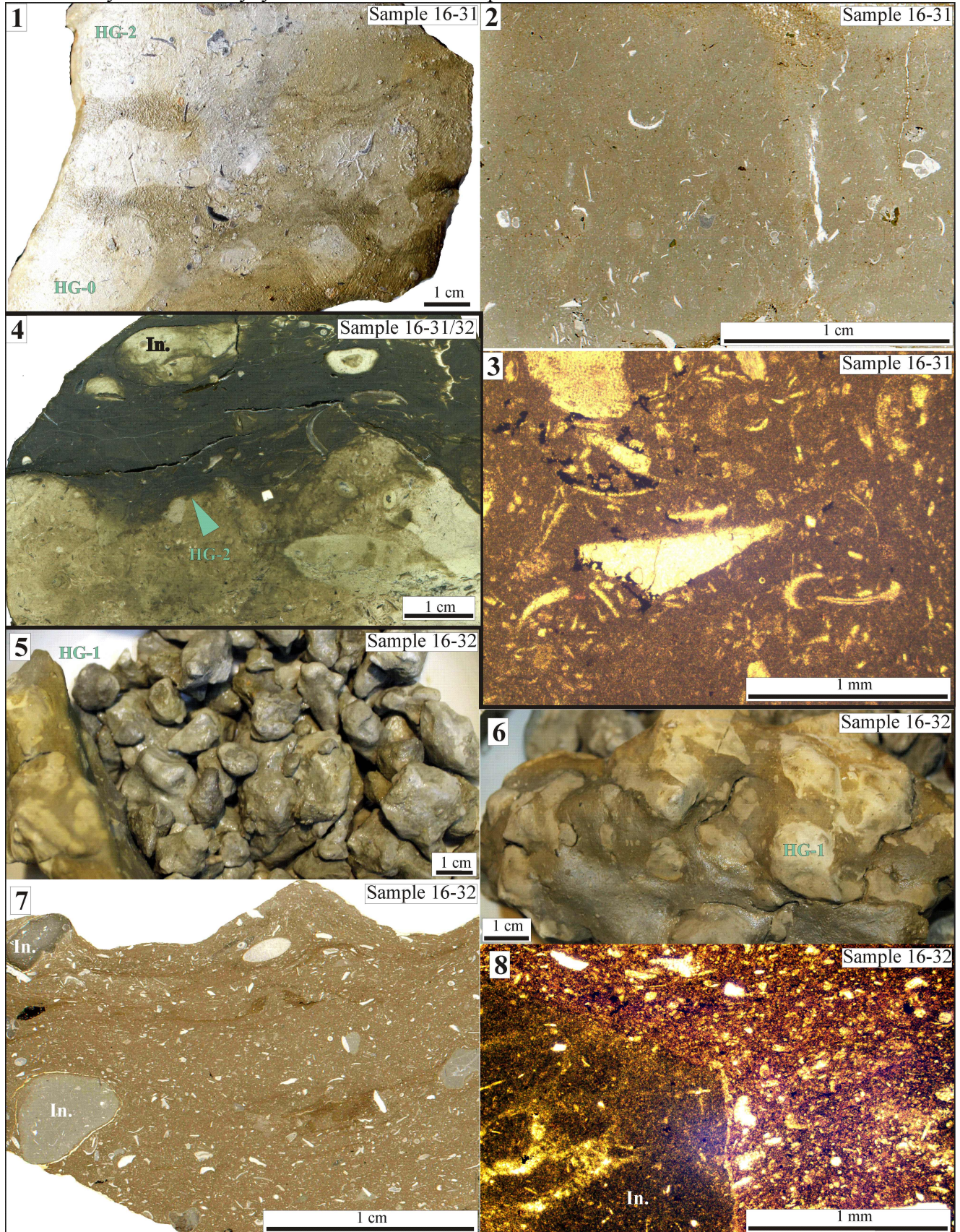


Table 7

Fig. 1. Concretion of bioturbated mudstones (HG-0). Sample 16-33.

Figs. 2–3. Bioturbated, slightly calcareous clays form a soft ground horizon. The folding is probably caused by modern (or ancient?) landslide processes or sediment compaction. Sample 16-33.

Figs. 4–5. The initial stage of nodular limestone formation (HG-0) occurs in slightly calcareous clays. Sample 16-34.

Figs. 6–8. Concretion of bioturbated mudstones (HG-0). Sample 16-35.

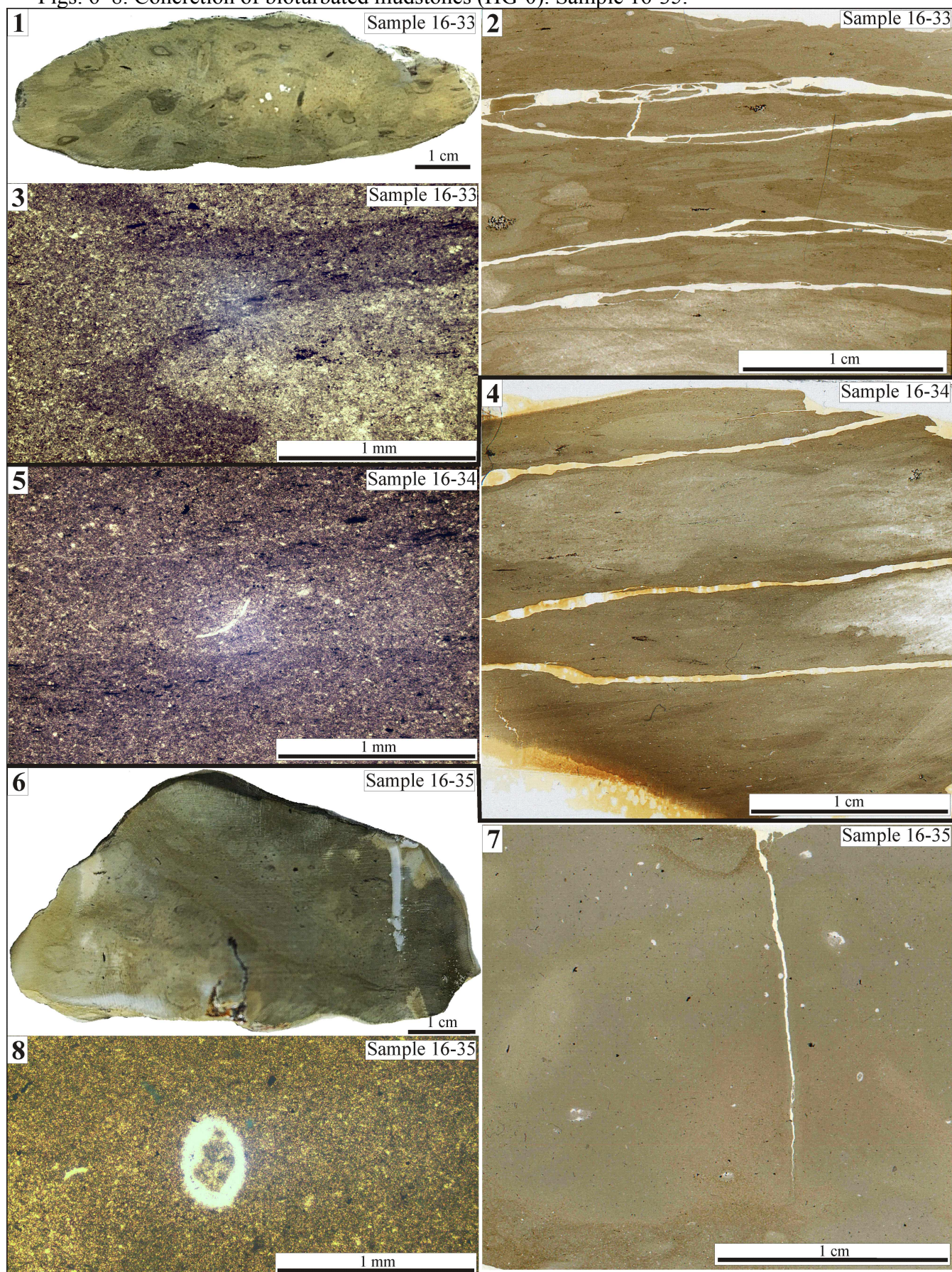


Table 8

Figs. 1–5. Concretion of bioturbated mud-wackestones. Figs. 1, 2, Sample 16-36; Figs. 3–5, Sample 16-37.

Figs. 6–8. Erosion surface along the incipient hard ground (HG-2) horizon composed of bioturbated mud-wackestones. Above these is wacke-packstones containing rare, well-rounded gravel- and pebble-sized intraclasts. Sample 16-1.

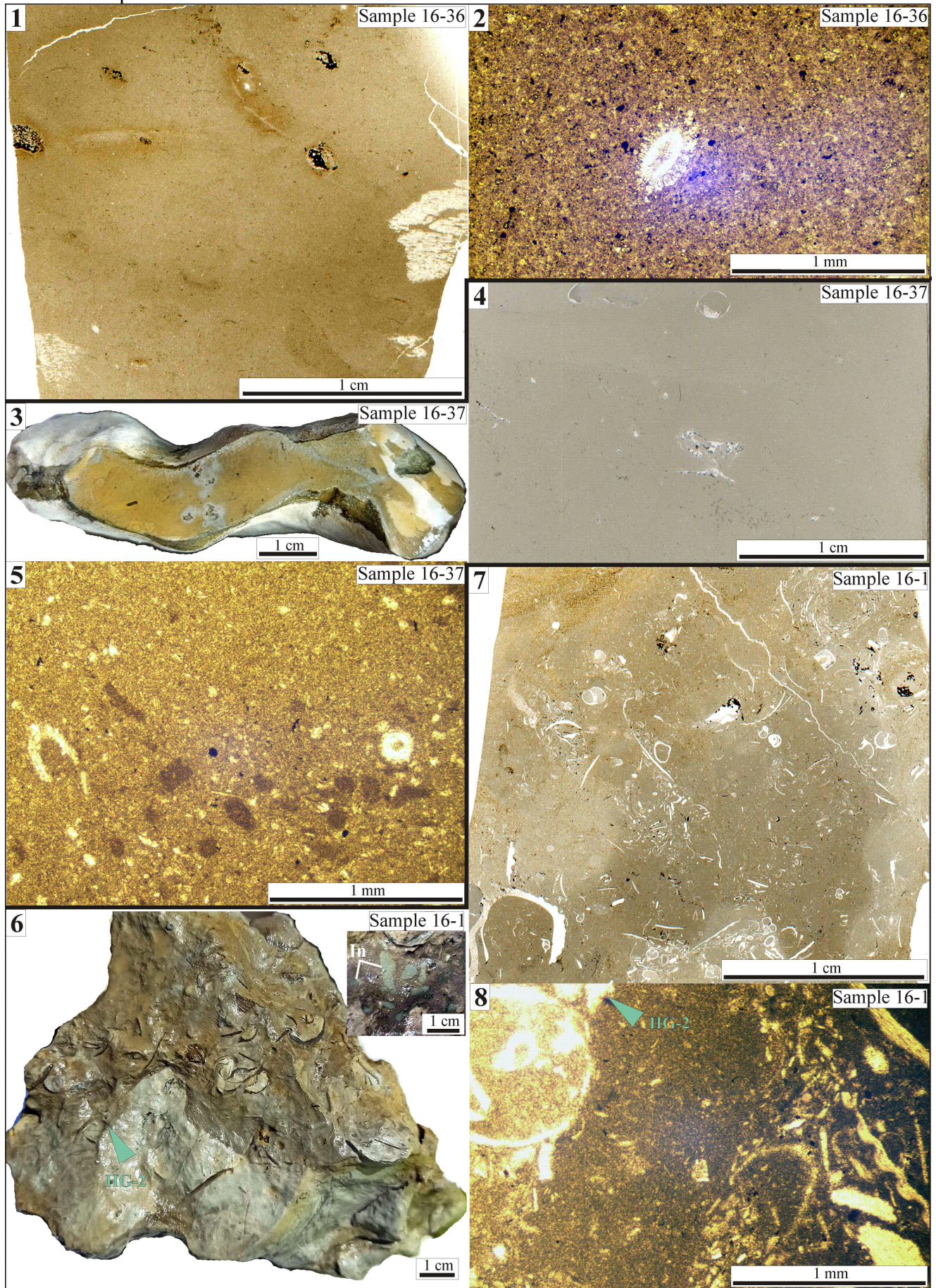


Table 9

Figs 1–4. Single concretion of mud-wackestones containing rare bioclasts and tentaculites. Figs. 1, 2, Sample 16-2; Figs. 3, 4, Sample 16-3.

Figs. 5–7. Bioturbated mud-wackestone concretions from the nodular limestone accumulation horizon. Burrows filled with micritic carbonate containing bioclasts, created by burrowing organisms, are clearly visible. Sample 16-4.

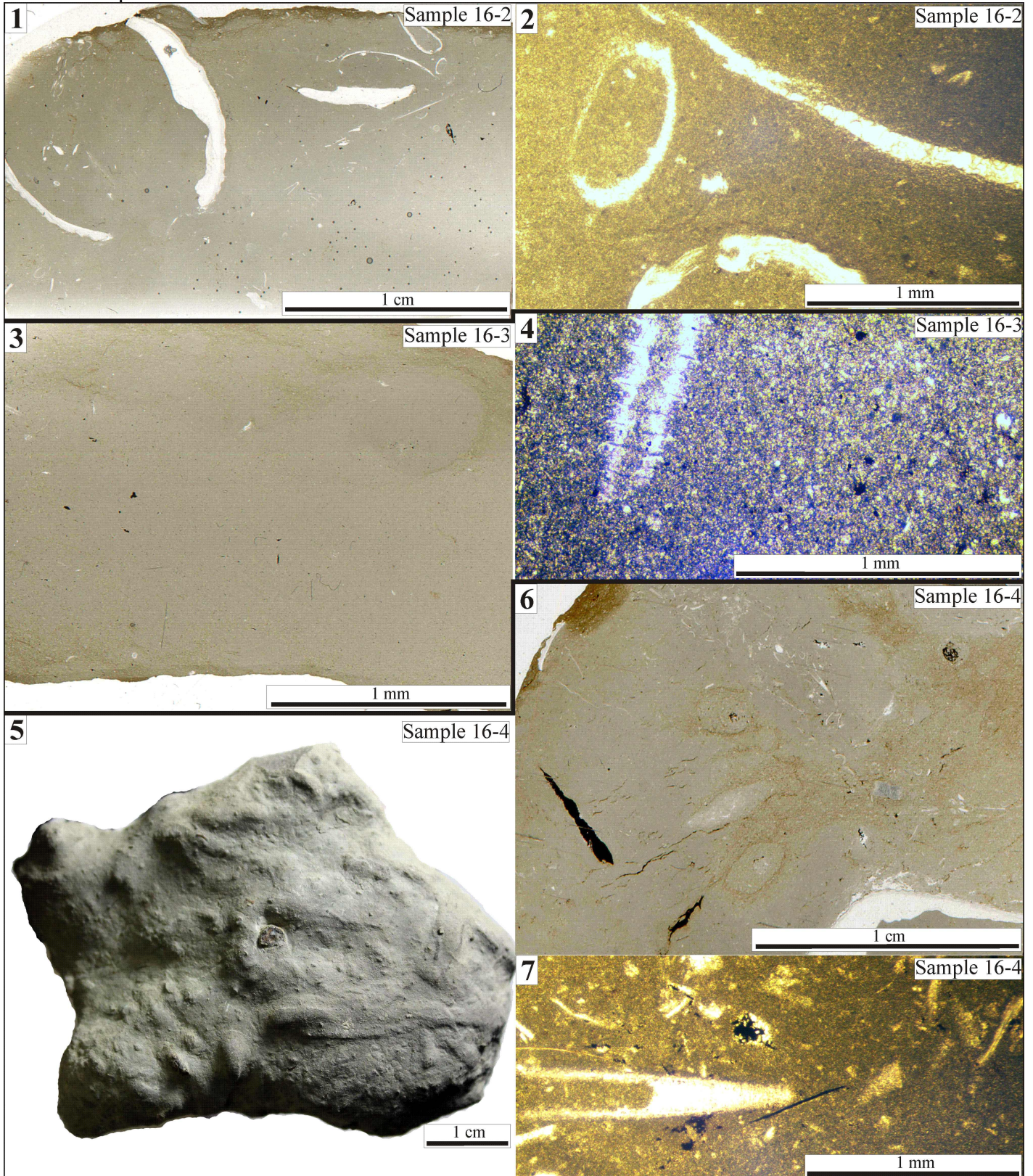


Table 10

Figs. 1–4. A layer of nodular, bioturbated mudstones in the immature stage of the nascent hard ground horizon (HG-2). The material filling the space between the nodules contains similar allochems to those of the nodules themselves. Sample 16-5.

Figs. 5–6. Concretions of bioturbated mud-wackestones with brachiopod shells. Sample 16-6.

Figs. 7–8. Bioturbated calcareous clay with rare, small bioclasts. It forms a soft ground horizon. Sample 16-7.

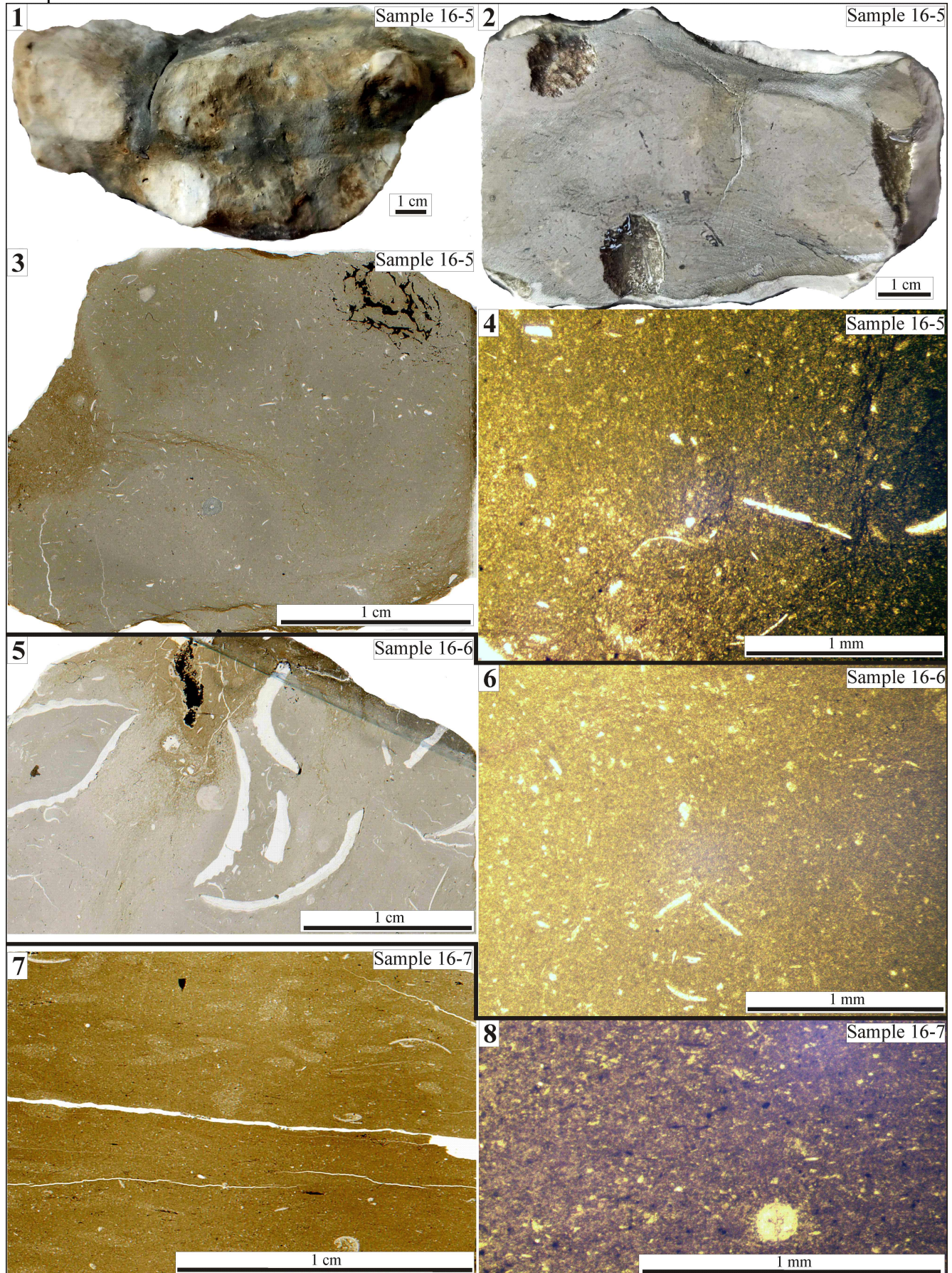


Table 11

Figs. 1–5. Concretions of bioturbated mudstones containing rare, small bioclasts. The burrows of burrowing organisms are clearly visible at the base of the concretions (Fig. 3). Figs. 1, 2, Sample 16-8; Figs. 3–5, Sample 16-9.

Figs. 6–8. Nodular bioturbated mudstones with rare bioclasts. Semi-lithified nodules merge to form a semi-continuous layer (HG-2). Sample 16-10.

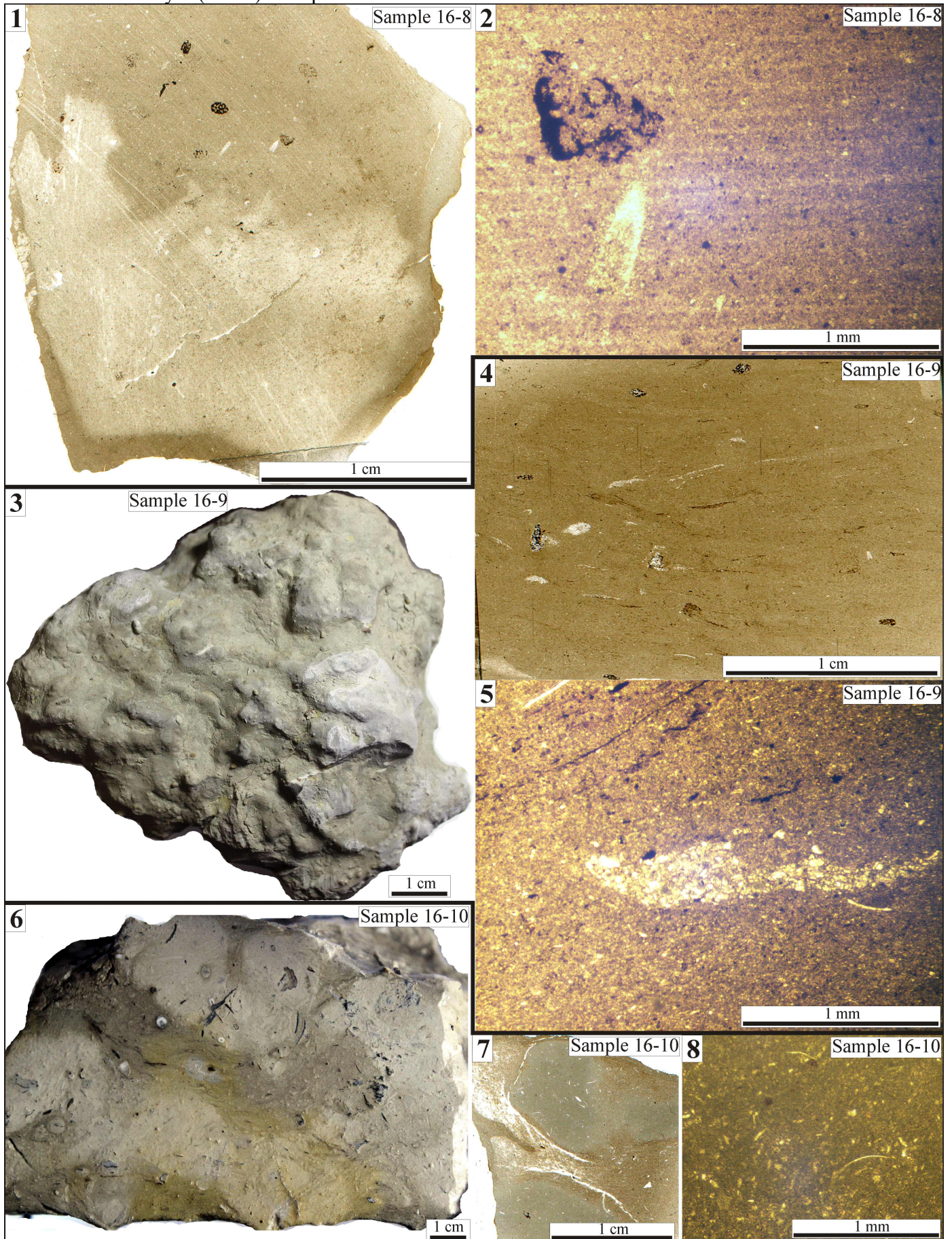


Table 12

Figs. 1–4. Nodular bioturbated wackestones. The upper part of the sample (Fig. 2) contains a layer of nodular limestone with rare rounded intraclasts of sand and gravel size, flattened intraclasts of pebble size, and brachiopods shells. The top of this layer has a bumpy surface (Fig. 1). Sample 16-11.

Figs. 5–6. Concretions of bioturbated mudstones with bioclasts of fine sand and silt sizes. Sample 16-12.

Figs. 7–8. The clay is unevenly calcareous. The lens-shaped, wavy layering is due to flattened horizontal burrows (soft ground). Sample 16-13.

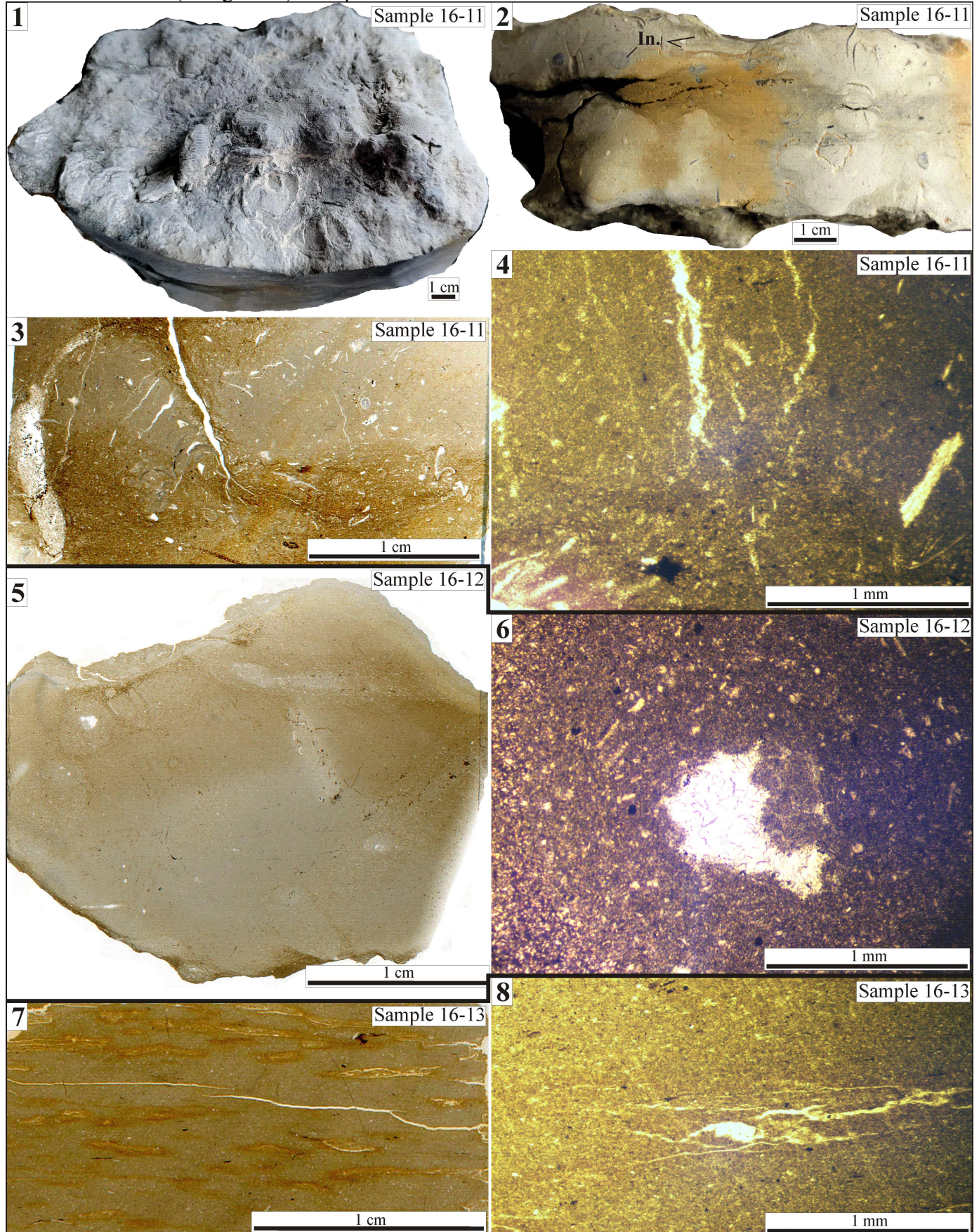


Table 13

Figs. 1–4. Concretions of bioturbated mud-wackestones. Figs. 1, 2, Sample 16-14; Figs. 3, 4, Sample 16-15.

Figs. 5–7. Intensively bioturbated mud-wackestones. The burrows contain an increased amount of bioclasts, which are represented by fragments of brachiopods, gastropods, and crinoids. Sample 16-16.

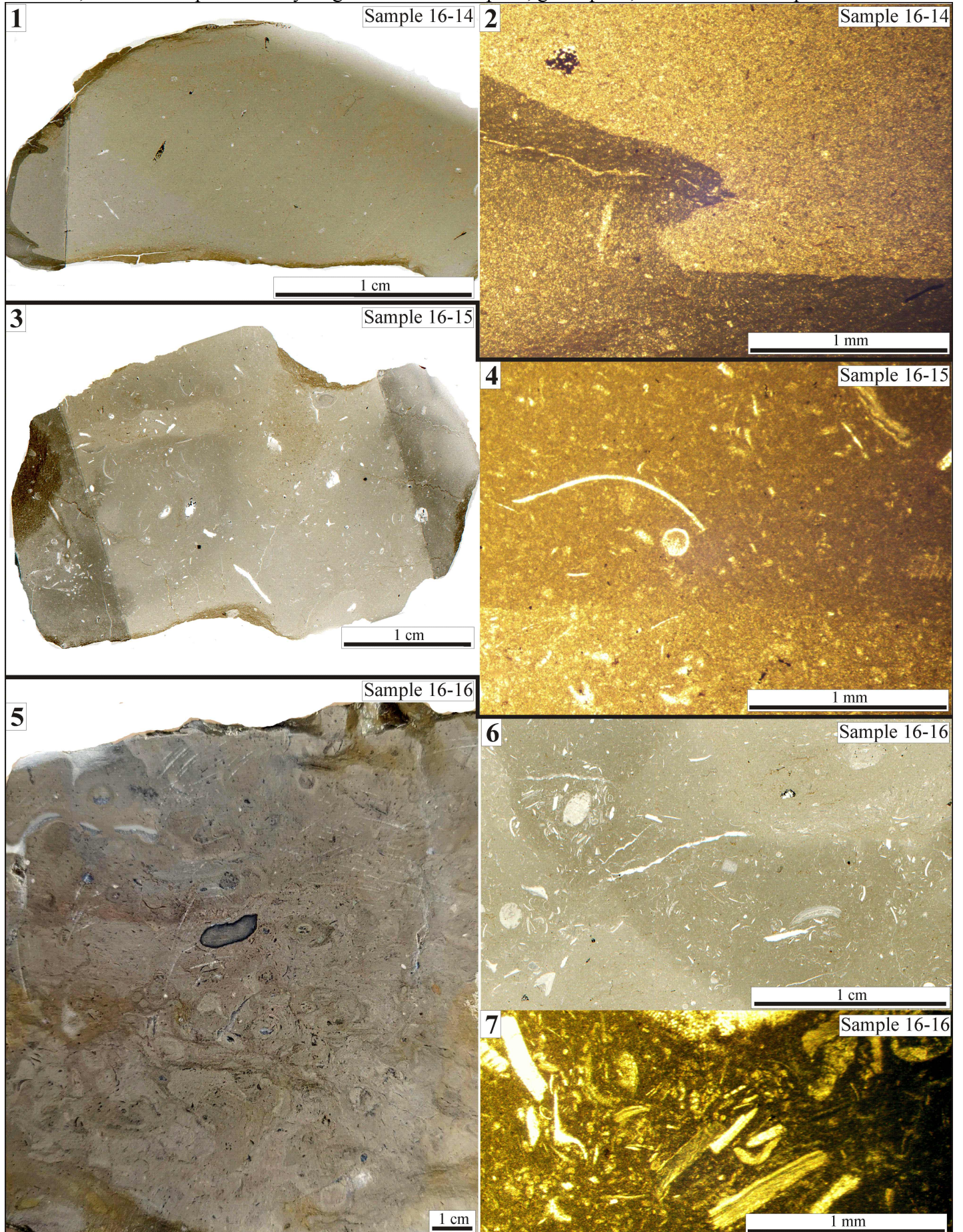


Table 14

Figs. 1–3. Bioturbated nodular mud-wackestones. Isometric nodules of various sizes form a concretionary slab. The bioclasts are predominantly fine- to medium-grained. Sample 16-17.

Figs. 4–7. Concretions of weakly bioturbated mudstones with rare, thin-walled ostracods and gastropods. Figs. 4–5, Sample 16-18; Figs. 6–7, Sample 16-19.

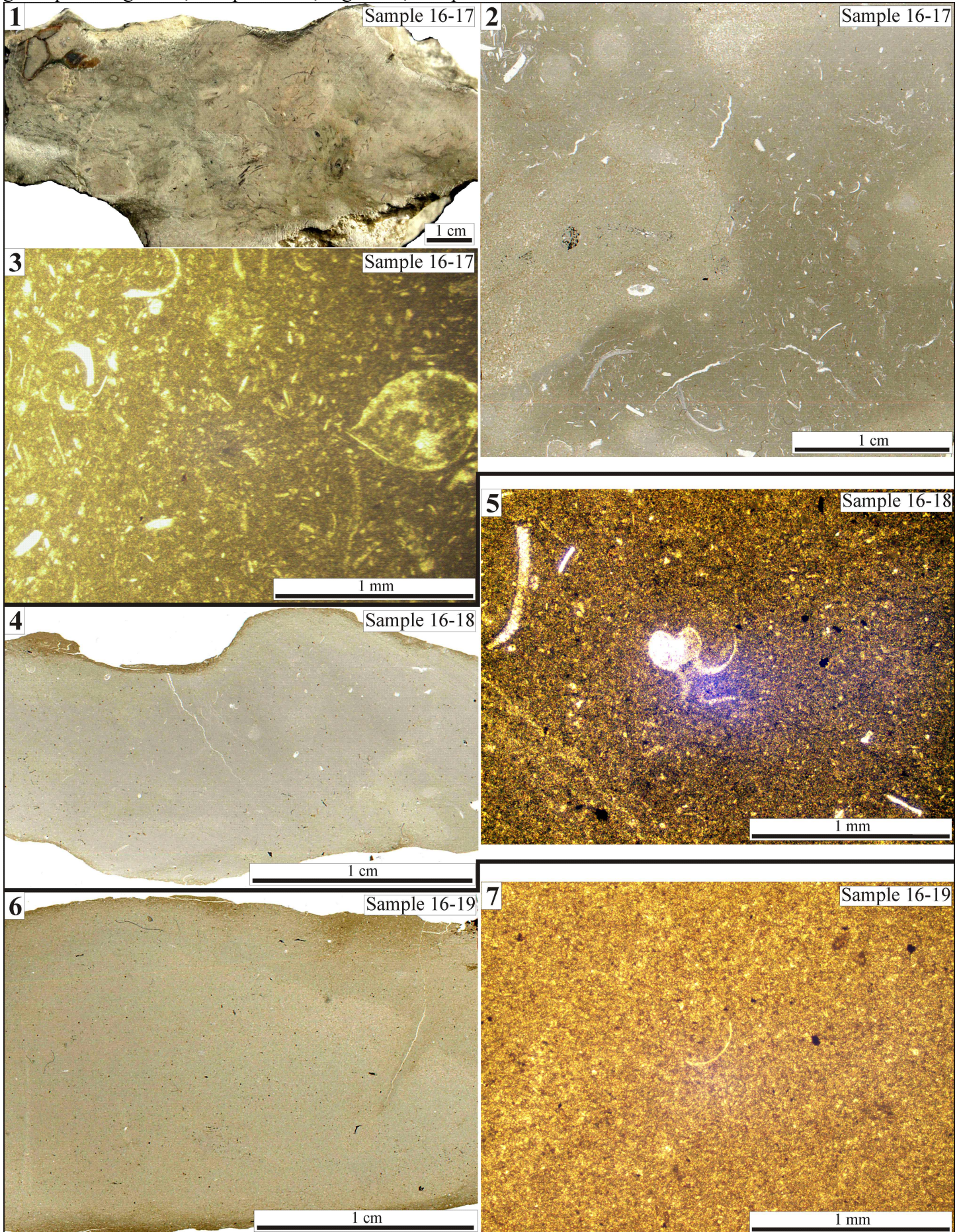


Table 15

Figs. 1–2. Concretions of weakly bioturbated mudstones containing rare, thin-walled ostracods. Sample 16-20.

Figs. 3–4. Concretions of bioturbated mudstones. The burrows of burrowing organisms contain styliolinids and unidentifiable bioclasts, which are absent from the surrounding and overlying sediments. This suggests the presence of local erosion. Sample 16-21.

Figs. 5–7. Nodular bioturbated mudstones in clays with rare bioclasts. Sample 16-22.

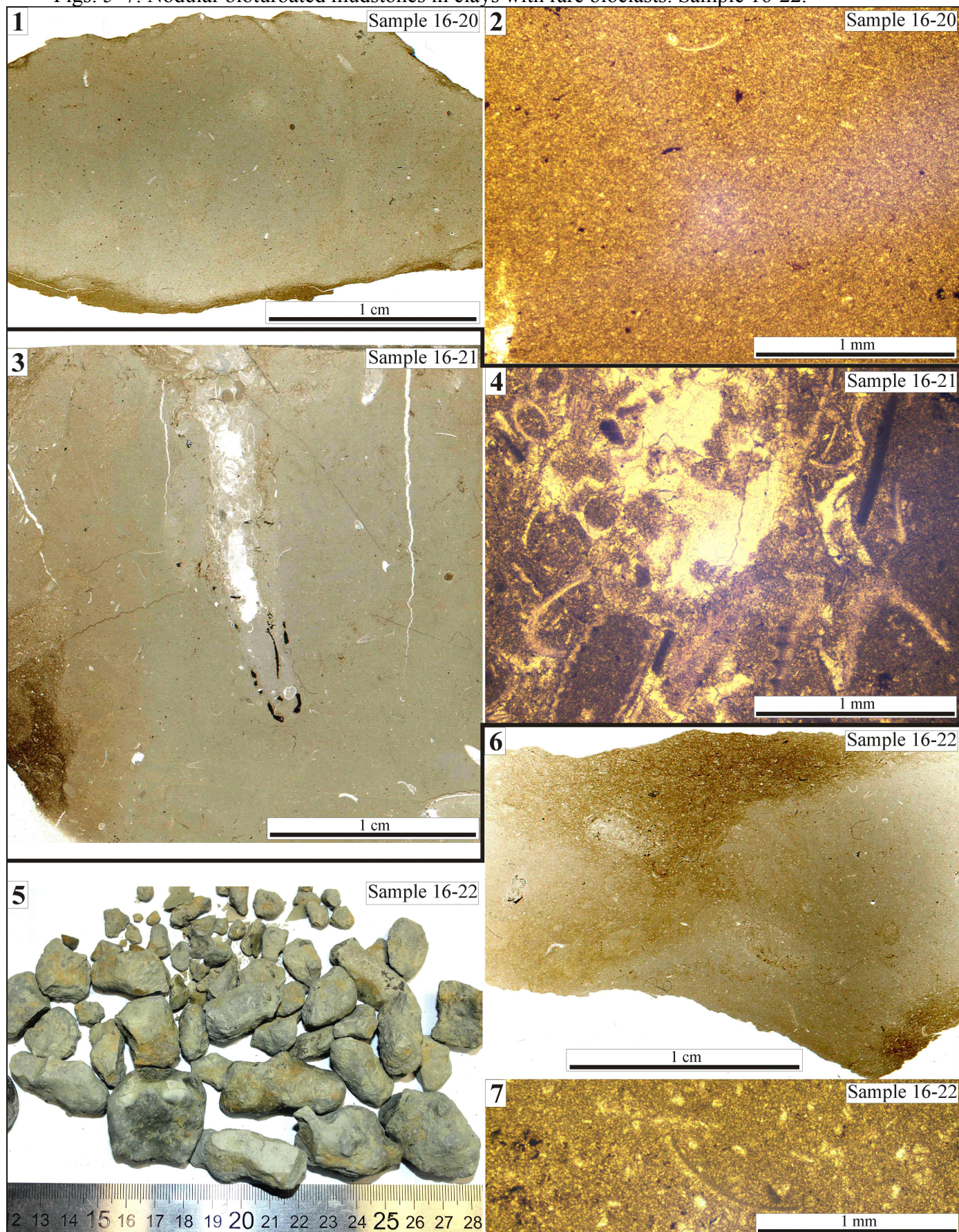


Table 16

Figs. 1–6. Concretions of weakly bioturbated mudstones with rare bioclasts. Figs. 1–2, Sample 16-23; Figs. 3–4, Sample 16-24; Figs. 5–6, Sample 16-25.

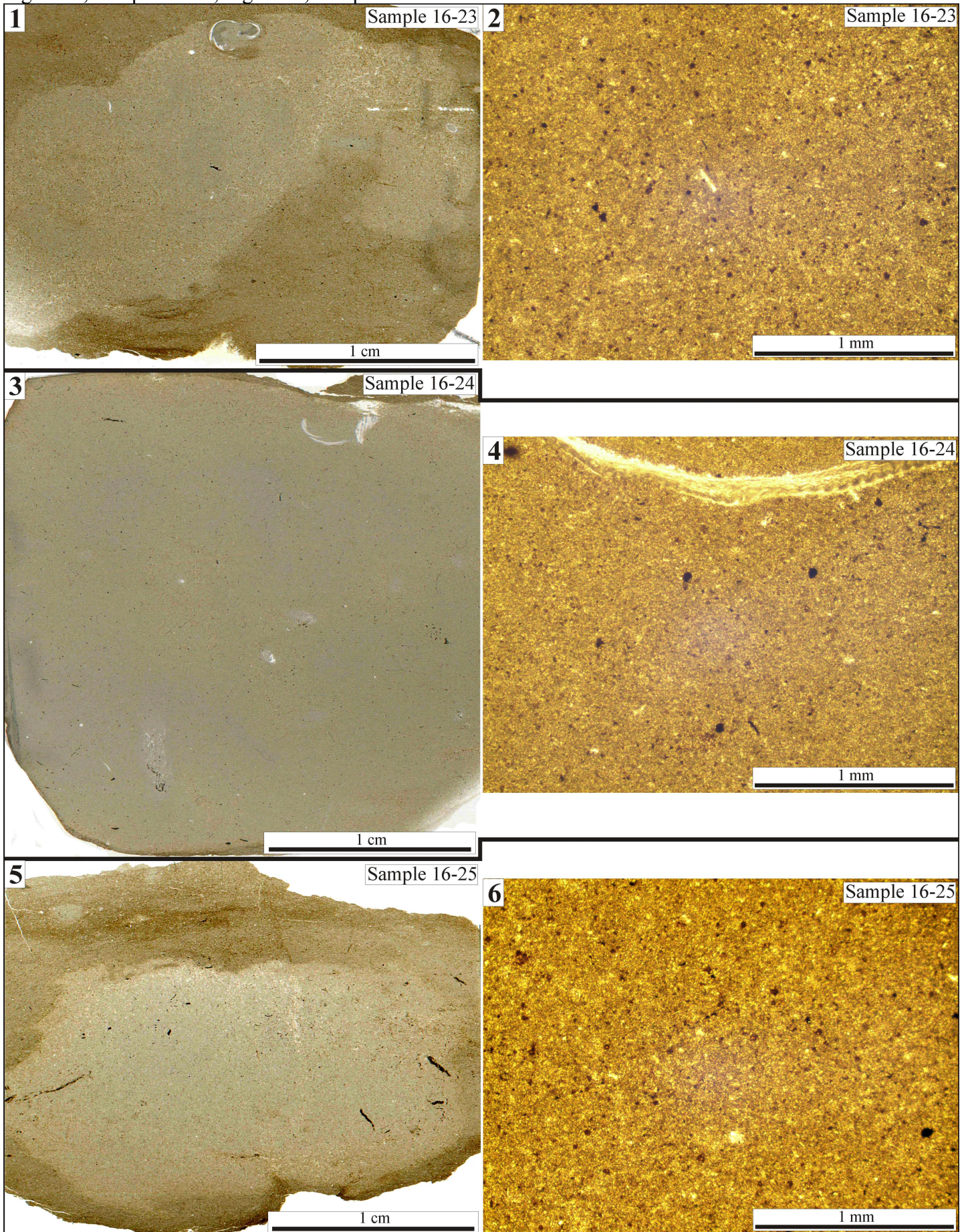


Table 17

Figs. 1–2. Concretions of weakly bioturbated mudstones containing rare, thin-walled ostracods. Sample 16-26.

Figs. 3–6. Intensely bioturbated mudstones. Cohesive nodules form a concretionary slab. Burrowing organisms' burrows are filled with micritic carbonate mixed with medium-grained bioclasts and rare, semi-rounded intraclasts of fine-grained mudstones. Sample 16-27.

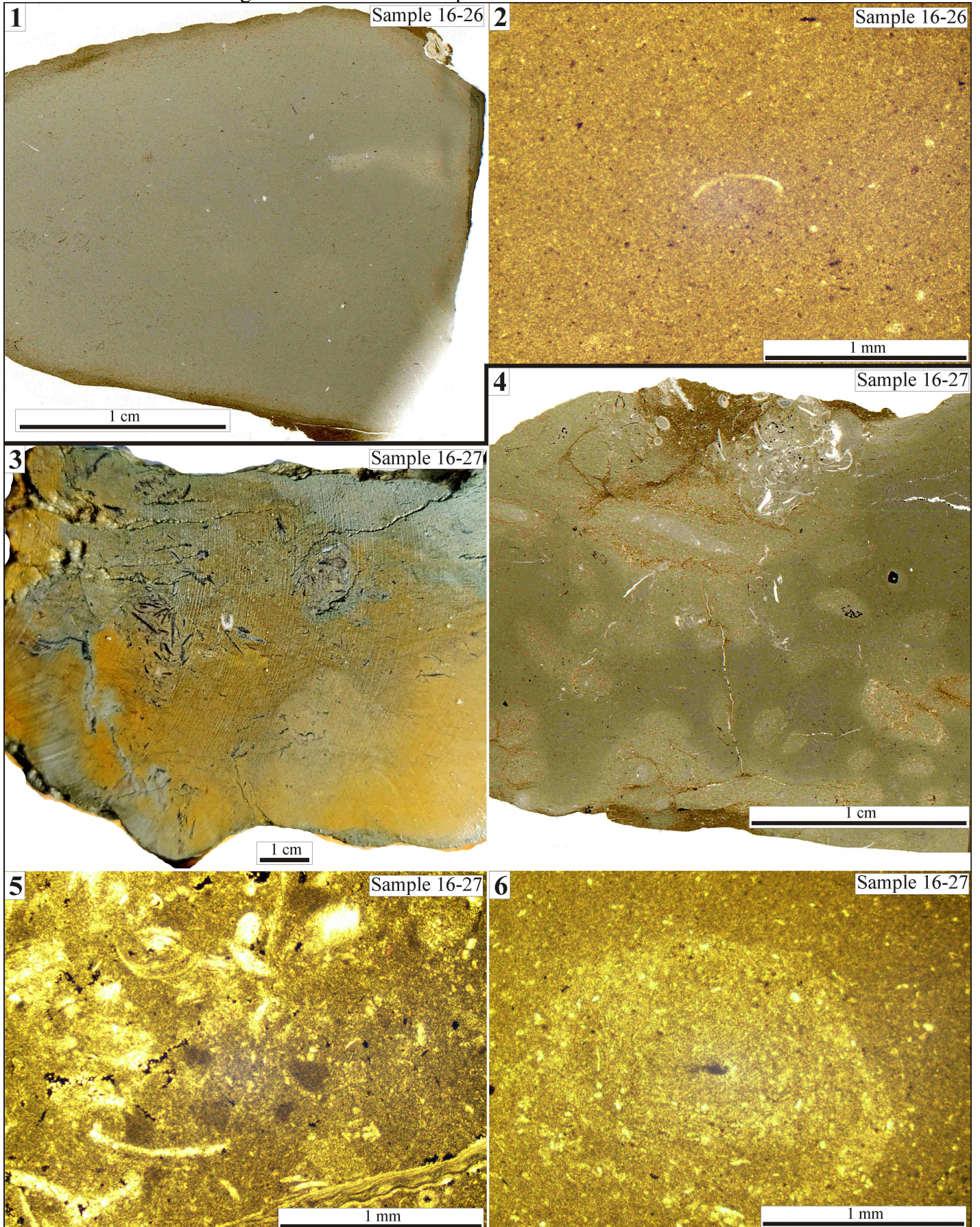


Table 18

Figs. 1–3. Intensively bioturbated mud-wackestones. Some nodules have a mineralized crust that differs slightly in color. Based on this, they can be considered a horizon of a formed hard ground (HG-3). Bioclasts of fine to medium grain size are unevenly distributed throughout the layer. Near the top, there are rare large fragments and whole shells of brachiopods and gastropods. Sample 16-28.

Figs. 4–7. Concretions of weakly bioturbated mudstones. Figs. 4–5, Sample 16-29; Figs. 6–7, Sample 16-30.

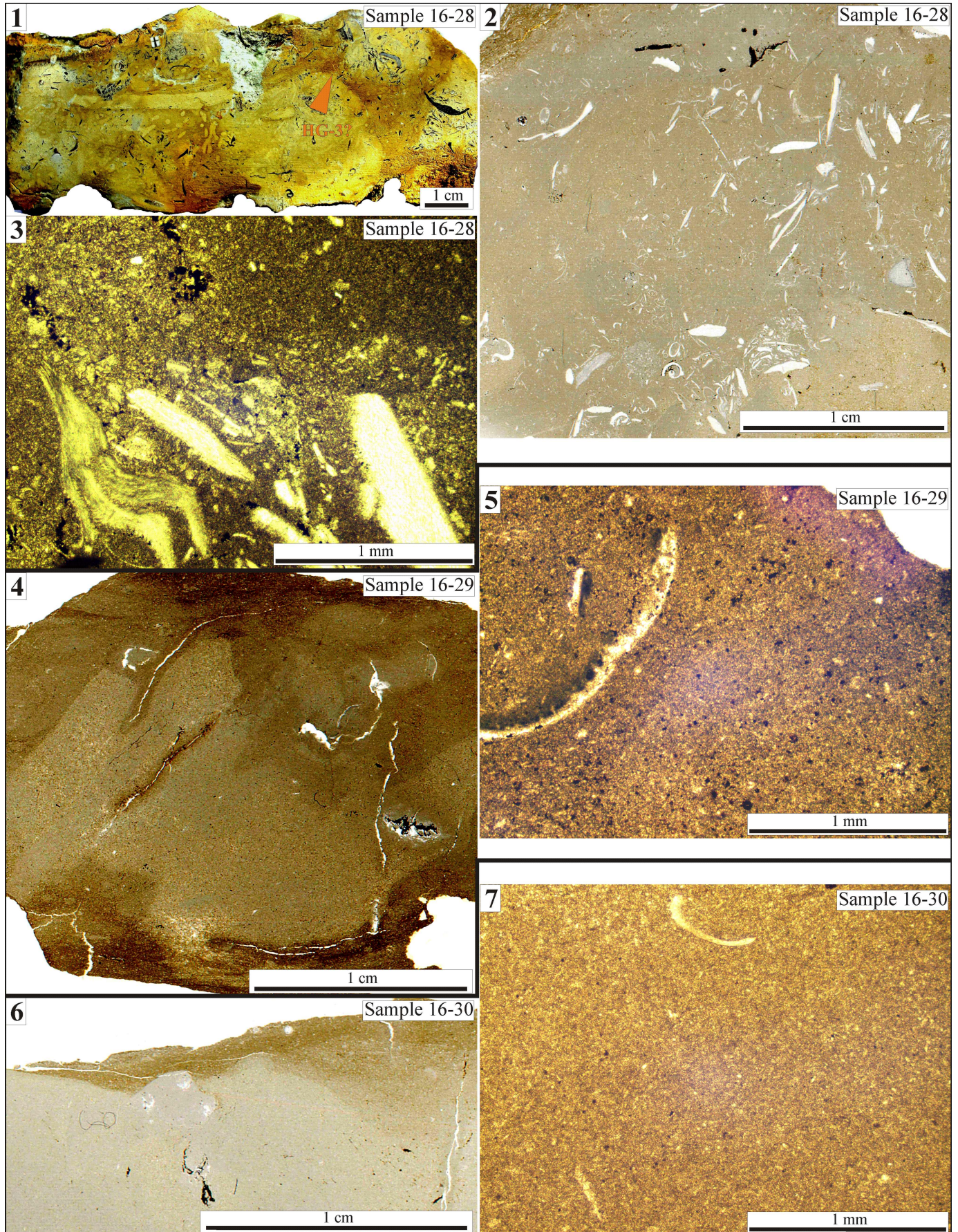


Table 19

Fig. 1. Concretions mud-wackestones. Sample 16-40.

Figs. 2–6. Intensely bioturbated and eroded mudstones and wackestones. Mudstones are present at the base, on which at there are least two horizons of hard ground (HG-3), each of which has been subjected to intense bioturbation and erosion (Fig. 3). These horizons contain occasional gravel-sized intraclasts with attached shell detritus fragments (Fig. 2). This indicates the erosion of incompletely lithified sediments. Mineralized hard ground crusts are not preserved everywhere. In most cases, they are eroded. Small burrows of burrowing organisms are clearly visible at the base of the layer (Fig. 5). Horizons of eroded hard ground are overlain by a layer of bioclastic, predominantly brachiopods wackestones (Fig. 6). Sample 16-41.

Figs. 7–8. Concretions mudstones with rare thin-walled ostracods. Sample 16-42.

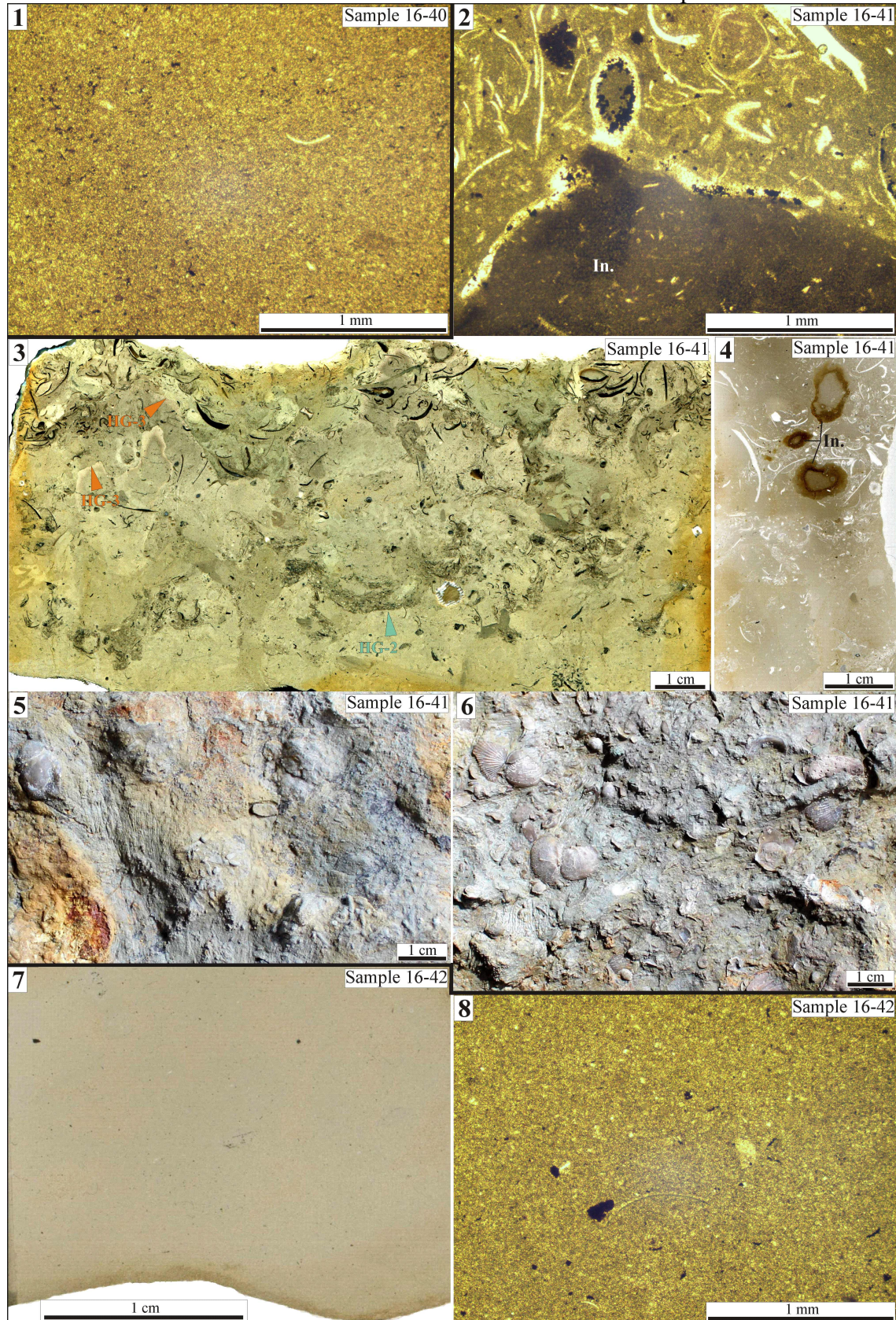


Table 20

Figs. 1–8. The hard ground horizon, located in the lower part of the layer, is covered with bioliticlastic wackestones and packstones (Fig. 1). The hard ground horizon consists of bioturbated mudstones. The surface of the hard ground forms gentle channels that are 15–20 cm wide. Underwater currents carry debris from shallower areas into these channels. The mineralized crust of the hard ground horizon is distinct, though eroded in places (Figs. 1, 5, and 7). Above the crust there are bioclastic packstones with an increased fauna content replaced by glauconite. Typically, a lens-shaped layer of darker greenish-gray packstones is present at the base, and the overlying layer is lighter greenish-gray and relatively consistent in thickness. The bioclasts are predominantly coarse-grained and include bivalves, gastropods, and crinoid segments. Large, whole ammonites (Fig. 8, *Timanites* cf. *keyserlingi* Mill., definition by A.V. Erofeevsky) and nautiloids are also present. Intraclasts, which are made of mudstones, have a smoothed, isometric, flattened shape due to the erosion of semi-lithified sediments, and range in size from pebbles to sand. Sample 16-43.

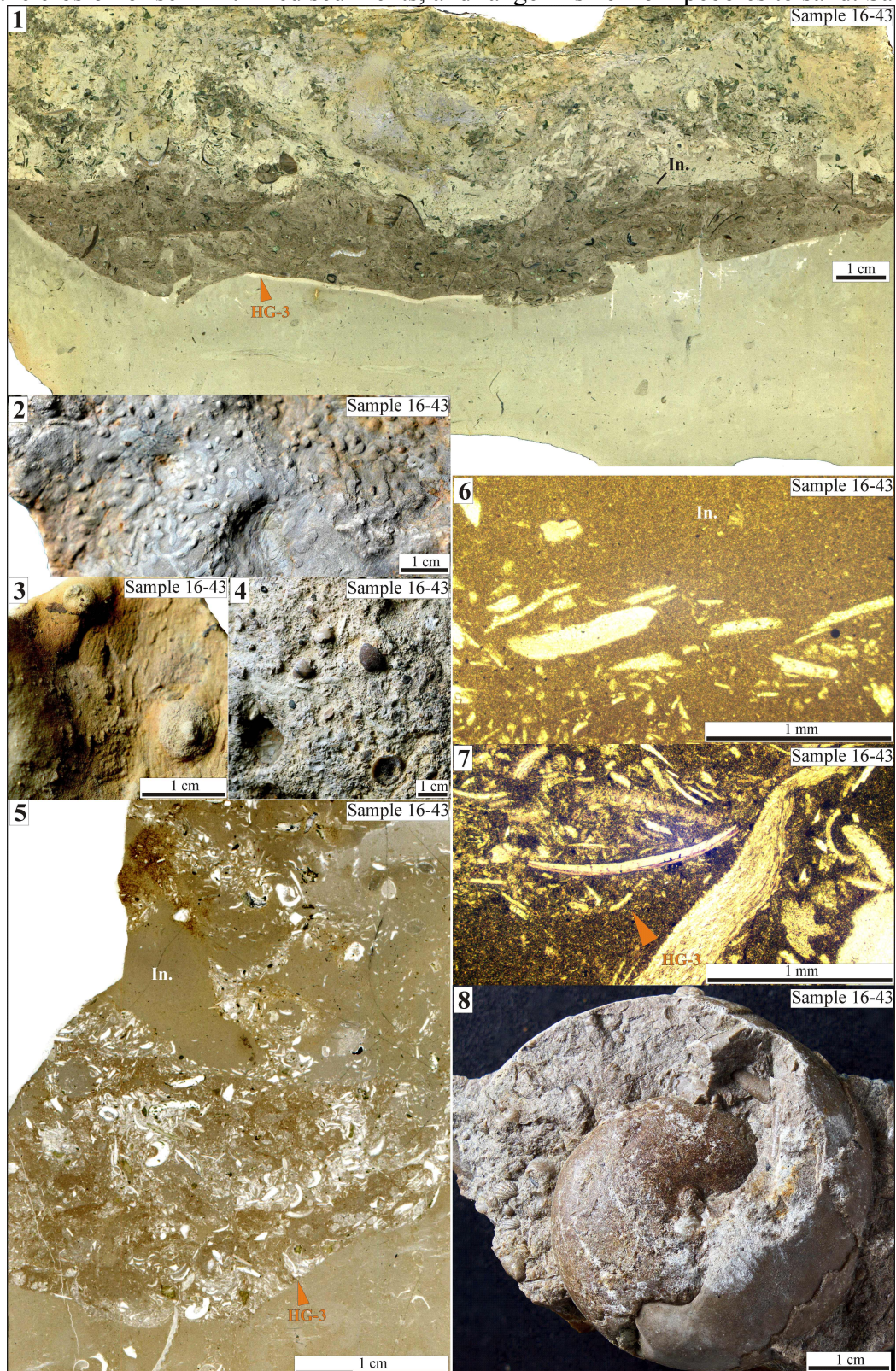


Table 21

Fig. 1. Fauna replaced by glauconite (including bivalves, gastropods, crinoid segments, and tentaculites). Sample 16-43.

Figs. 2–3. Lens-shaped interlayers of mudstone containing rare ammonite, brachiopod, gastropod, and tentaculate remains in greenish-gray clay. Sample 16-43a.

Figs. 4–6. The hard ground horizon, located at the base of the layer, is covered with bioliticlastic wackestones and packstones (Fig. 4). The hard ground horizon consists of bioturbated mudstones (Figs. 5 and 6). The surface of the hard ground is bizarrely cup- or box-shaped and divided by I- or T-shaped ridges up to 8 cm high. Such relief forms could have formed due to the erosion of semi-lithified sediment deeply dug by crustaceans. The mineralized crust of the hard ground horizon is distinct and varies in width. It is eroded in places. Above it there are bio-intraclastic packstones with an increased fauna content replaced by glauconite. Typically, the base consists of a lens-shaped interlayer of dark, greenish-gray packstones of varying thickness. The overlying interlayer is lighter greenish-gray and relatively uniform in thickness. Bioclasts, which are predominantly coarse-grained, include bivalves, gastropods, and crinoids segments. Large ammonites and nautiloids are less common. Intraclasts are scarce and are represented by mudstone. They have smoothed, isometric, flattened, or curved shapes, resulting from the erosion of semi-lithified sediments, and range in size from pebbles to sand. Sample 16-44.

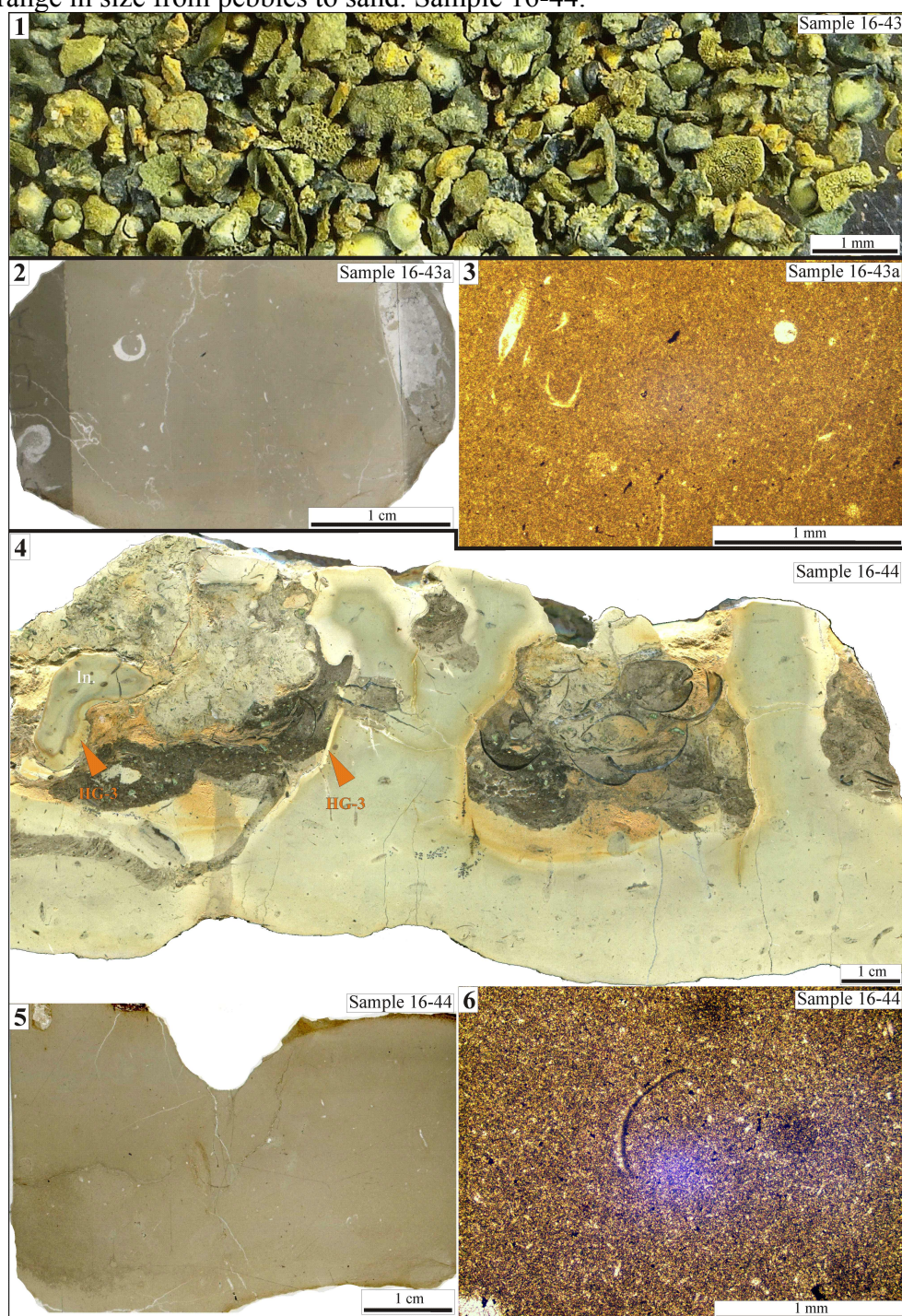


Table 22

Figs. 1–4. Concretions of weakly bioturbated mudstones containing rare, thin-walled ostracods. Figs. 1–2, Sample C1242-1; Figs. 3–4, Sample C1242-2.

Figs. 5–7. Hard ground horizon in mudstones. The base (Fig. 5) contains rounded depressions ranging from 0.5 to 1.5 cm in diameter. These depressions were probably formed when semi-lithified mudstones were pushed through by gas bubbles arising from the decomposition of organic remains. Sample C1242-3.

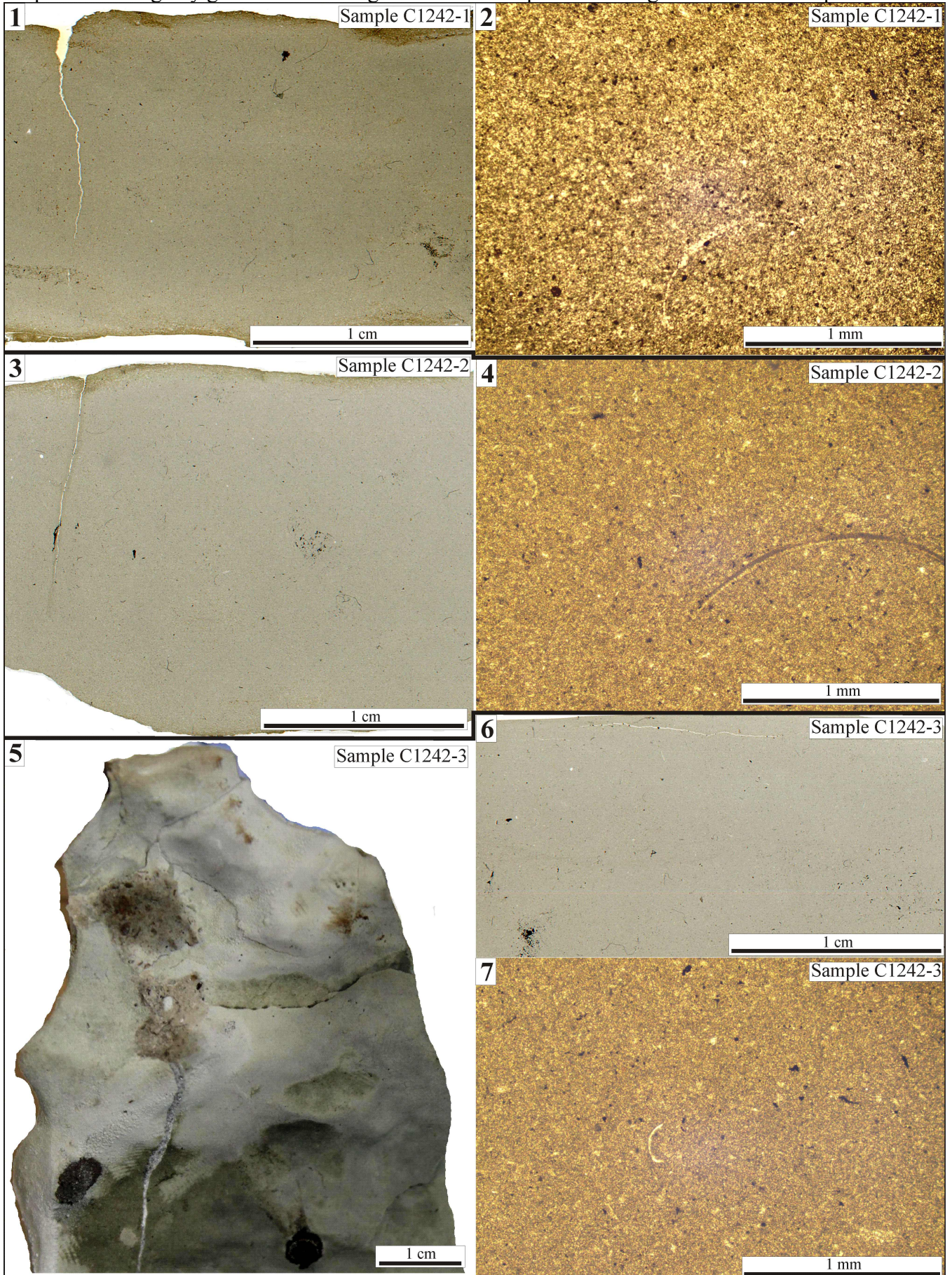


Table 23

Figs. 1–3. A complex limestone slab consisting of four horizons of hard ground (Figs. 1, 2). The lower horizon of the hard ground is represented by mudstones. The erosion surface in its roof is gently undulating, with shallow gullies (the first few centimeters). The mineralized light crust is not preserved everywhere. The overlying sediments are composed of bio-litoclast bioturbated packstones represented by three horizons of hard ground. Mineralized crusts stained with iron hydroxides are not preserved everywhere. The size of the intraclasts (mudstones) decreases from pebbles to sand upwards through the section. The same pattern is seen in the size of large fauna, such as ammonites and nautiloids, as well as in the size of bioclasts, which decrease from coarse to fine grained. Bio-intraclast packstones often contain fauna that have been replaced by glauconite. Traces of burrowing organisms are visible in the roof (Fig. 3). Fig. 1, samples C1242-3–4; Fig. 2, trench at the base of the outcrop, samples C1242-3–5; Fig. 3, roof of the slab, Sample C1242-4.



Table 24

Figs. 1–3. Bio- and intraclastic packstones. Intraclasts are gravel- to pebble-sized and are represented by mudstones. Sample C1242-3a.

Figs. 4–6. Packstones with an admixture of small intraclasts. The bioclasts are predominantly coarse-grained and are represented by brachiopods, gastropods, nautiloids, and so on. Intraclasts are fine-grained and represented by rounded grains (pellets?) of micritic carbonate. The cement is sparitic and recrystallized with relics of micrite. Sample C1242-4.

Figs. 7–10. A complex limestone slab consisting of at least four layers (Fig. 7). The bottom layer is a hard ground surface formed by mudstones. Its eroded surface is gently undulating, with shallow gullies (the first few centimeters). The mineralized light crust of the hard ground surface is not preserved everywhere due to erosion (Fig. 8). The two overlying layers consist of biointraclast bioturbated wacke- packstones that differ in color (grayish green and dark gray, almost black, due to the presence of organic matter). Rare gravel-sized intraclasts are composed of mudstones. The roof of the dark gray bio-intraclastic wacke-packstones contains burrows of burrowing organisms that are filled with fine micritic carbonate material from the upper layer (Figs. 7, 9). Sample C1242-5.

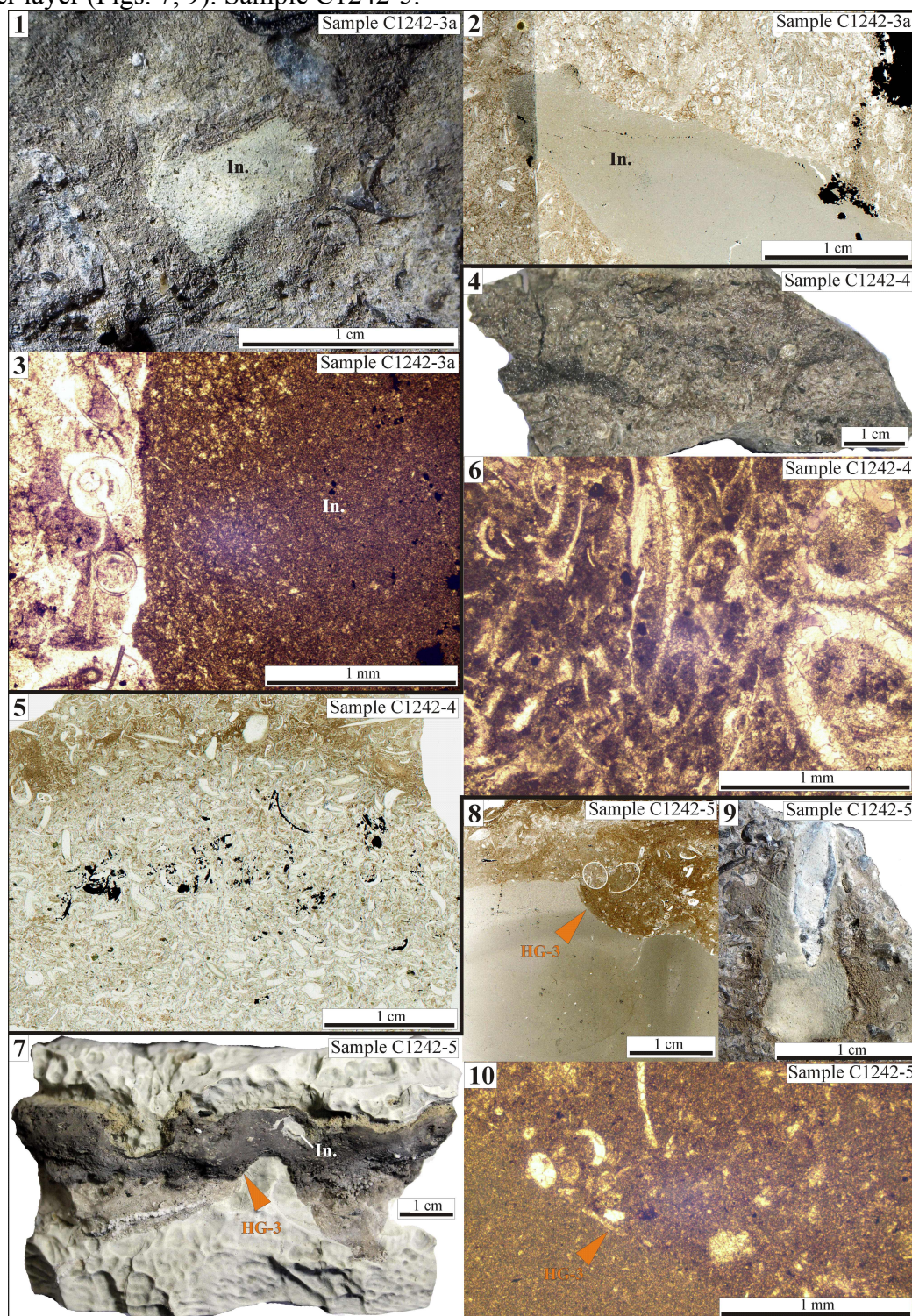


Table 25

Figs. 1–2. Concretions mudstones. Sample C1242-6.

Figs. 3–5. Large, lens-shaped layers. The base is composed of bioturbated mudstones with an uneven, partially eroded surface and a mineralized crust that is preserved in some places. The base contains a small amount of gravel-sized intraclasts of clayey mudstones (Figs. 3 and 4). A layer of bio-intraclastic, bioturbated packstones lies on the eroded surface of the hard ground (HG-3). The intraclasts, which are in the form of flattened pebbles, are composed of bioturbated mudstones. They represent a reworked hard ground horizon (HG-3). The bioclasts are predominantly coarse-grained and consist of fragments of brachiopods, gastropods, bivalves, and other shells. Sample C1242-6a.

Figs. 6–7. Arthrodire shell plates *Eastmanosteus* cf. sp. (definition by P.A. Beznosov). Sample C1242-6a.

Figs. 8–9. The hard ground horizon is formed by bioturbated mudstones. The erosion surface has a box-like profile and cuts to a depth of up to 1.5 cm. It is filled with packstones. Sample C1242-7.

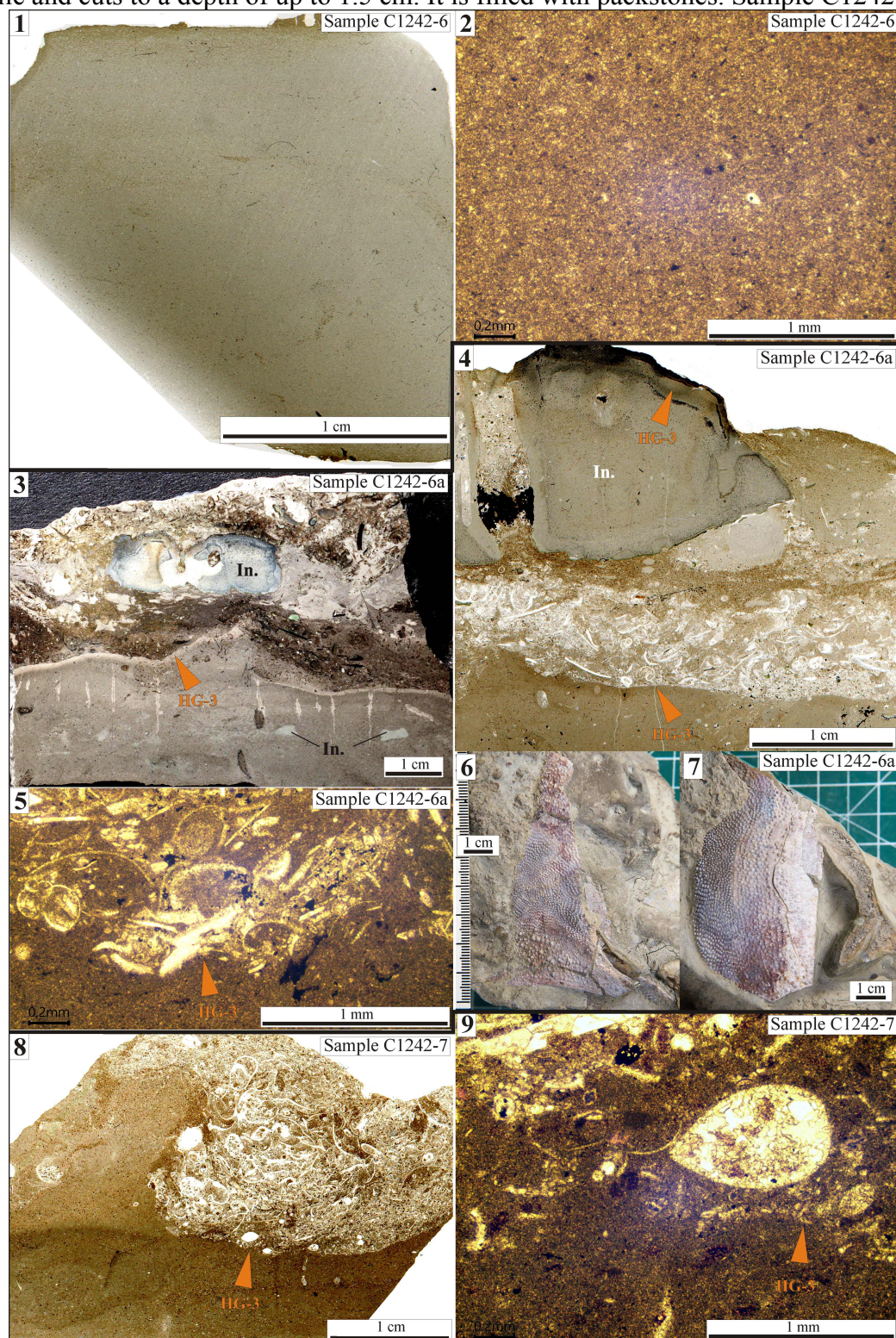


Table 26

Figs. 1–2. Hard ground horizon in mudstones. It is overlapped by pack- grainstones with intraclasts composed of mudstones. Sample C1242-7a.

Figs. 3–6. Hard ground horizon in laminated mudstones. It is overlapped by pack-grainstones with intraclasts composed of mudstones. The erosion surface has a bizarre configuration and sometimes forms flattened channels with subvertical walls. Sample C1242-7b.

Figs. 7–8. Hard ground horizon in mudstones. It is overlain by pack-grainstones. Sample C1242-8.

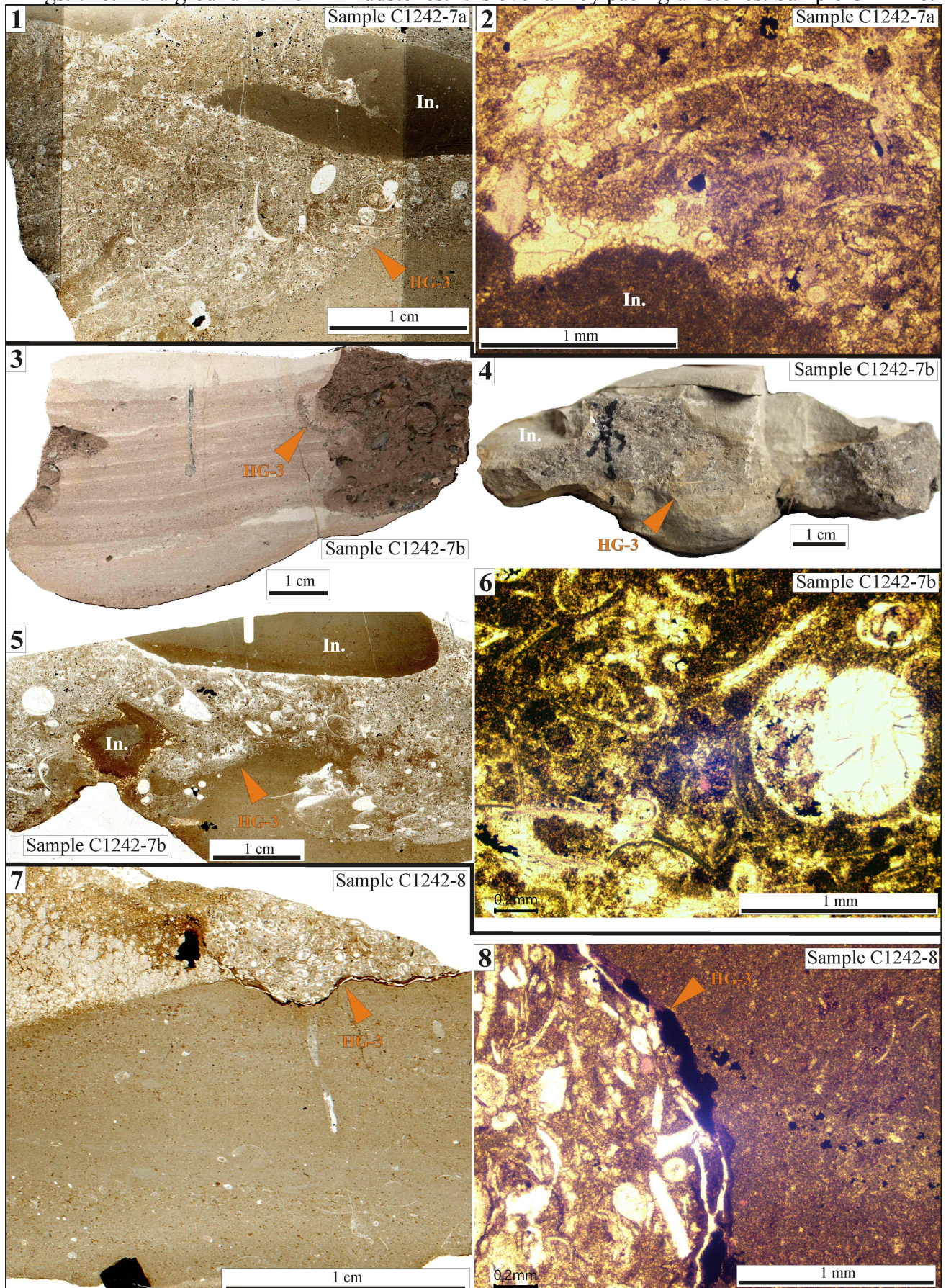


Table 27

Figs. 1–4. A hard ground horizon formed on cross-bedded and laminated mud- wackestones. The uneven, gently undulating erosion surface is covered by layered pack- grainstones with intraclasts. Large intraclasts are represented by isometrically flattened mudstone pebbles with a mineralized crust (Figs. 1–2). Smaller intraclasts are sandy mudstones that are well sorted and rounded (Fig. 3). Sample C1242-9.

Figs. 5–8. Two layers of massive recrystallized grainstones. Both layers contain relics of sandy mudstone grains. A slightly wavy erosion surface is clearly visible in the roof of the upper layer (Fig. 7), over which lie black styliolinid argillites with poorly rounded intraclasts of sandy-gravelly grainstones. Figs. 5–6, sample C1242-10; Figs. 7–8, sample C1242-11.

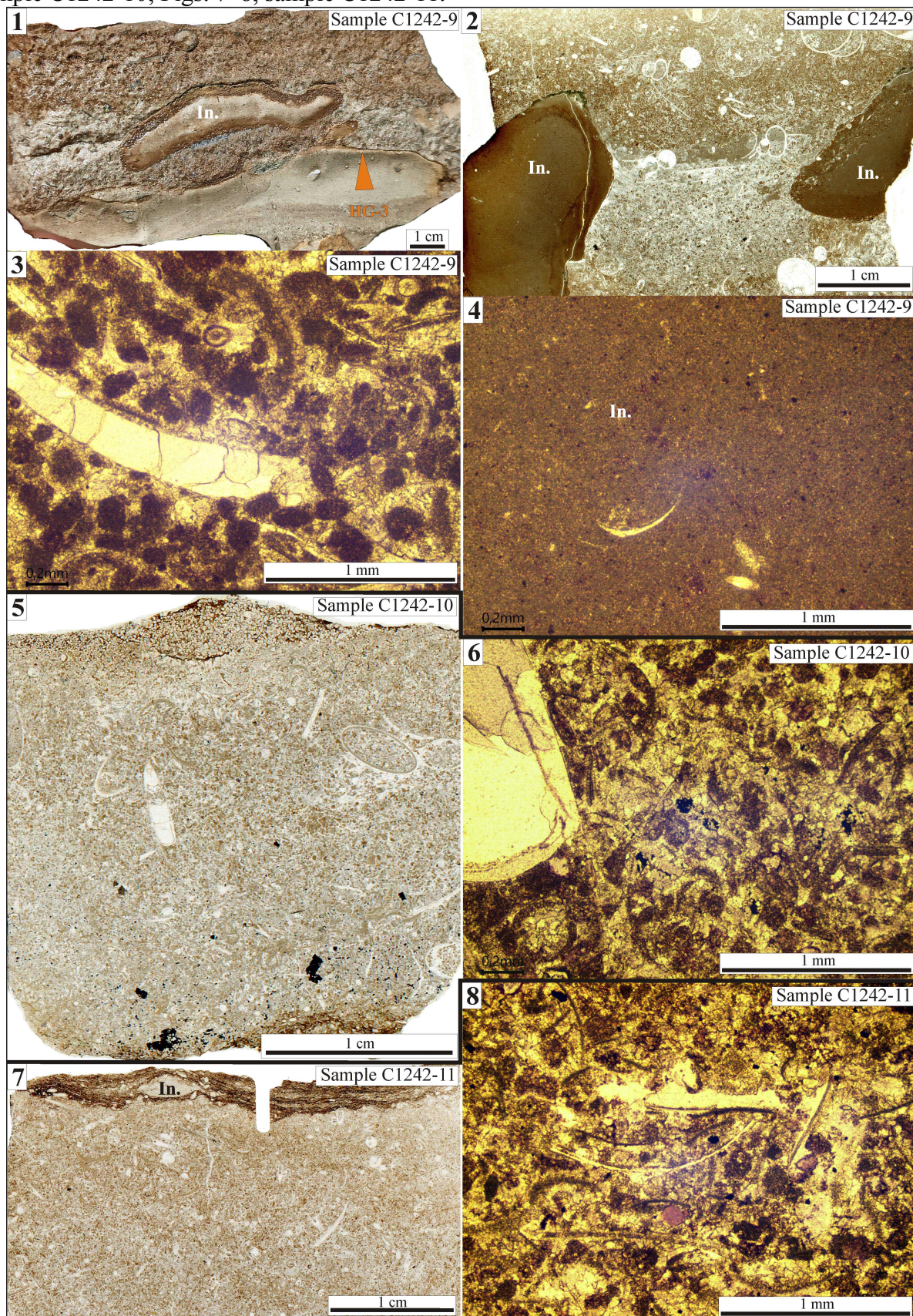


Table 28

Figs. 1–6. Styliolinid grainstones. The rocks are heavily recrystallized. Figs. 1–2, Sample C1242-12; Figs. 3–4, Sample C1242-13a; Figs. 5–6, Sample C1242-13b.

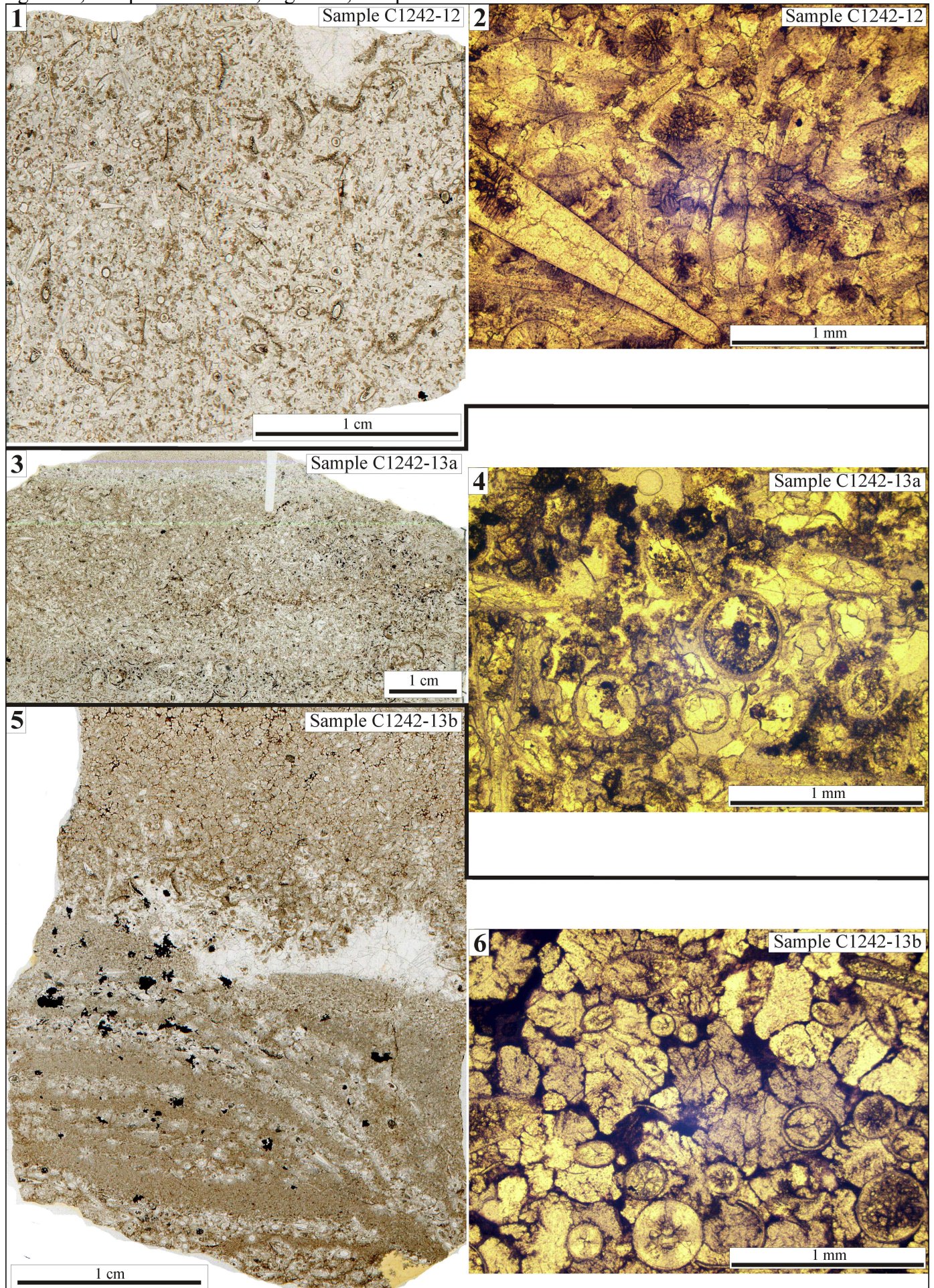


Table 29

Figs. 1–2. Grainstone. The fauna is represented by bivalves, ammonoids, nautiloids, and styliolinids. The rock is heavily recrystallized. Sample C1242-14.

Figs. 3–6. Thin layer of styliolinids grainstone in styliolinids argillite. Sample C1242-15.

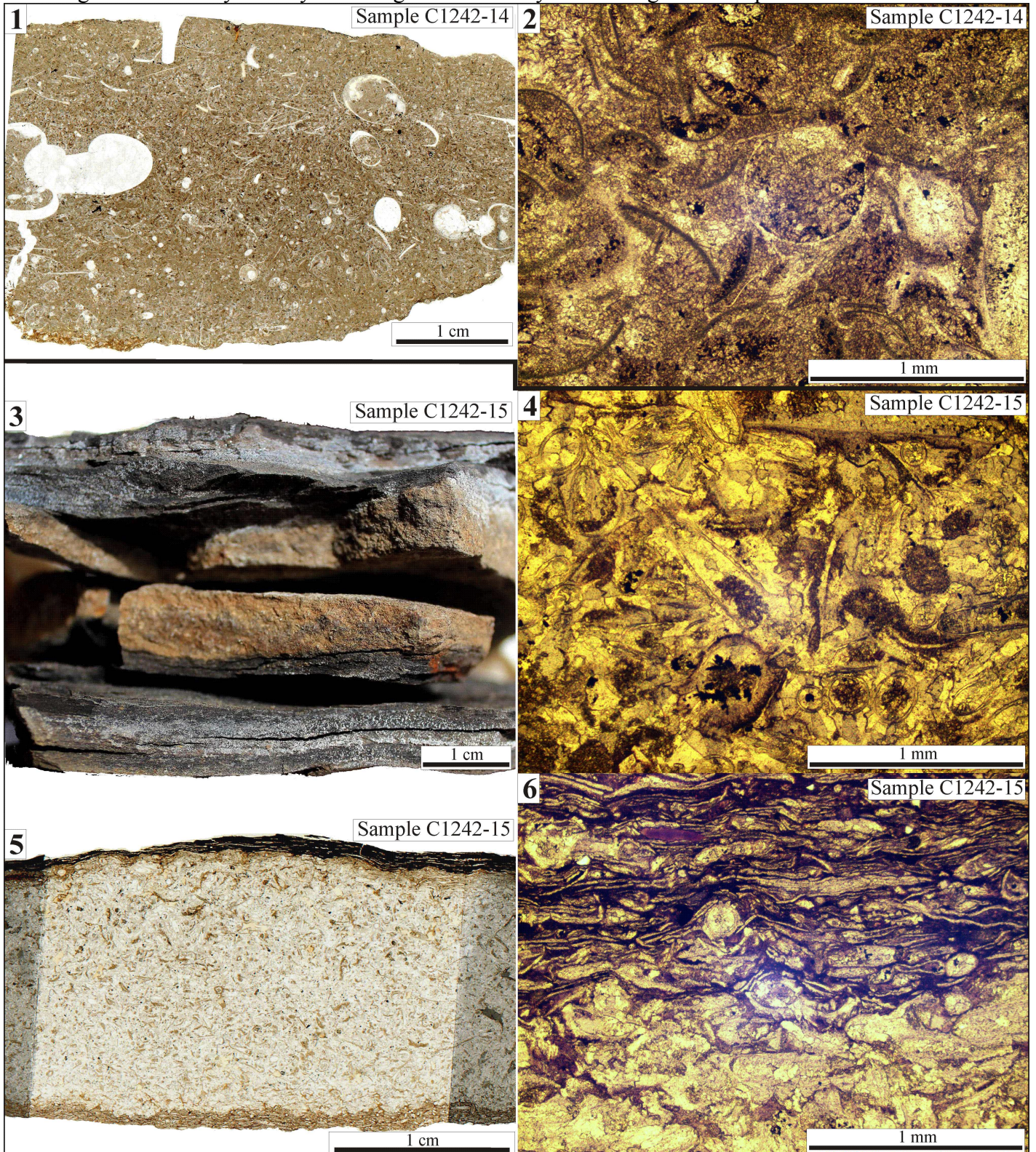


Table 30

Fig. 1. Greenish-gray clay. Sample 7-1.

Figs. 2–5. Layer of bio-intraclastic packstones. The intraclasts, composed of mudstones in the form of flattened pebbles, represent a reworked hard ground horizon (HG-3). The bioclasts are predominantly coarse-grained and consist of fragments of brachiopods, gastropods, nautiloids, and other shells. Sample 7-2.

Figs. 6–7. Bio-intraclastic packstones with sand-sized intraclasts consisting of mudstones. Bioclasts include nautiloids, styliolinids, and ostracods. Sample 7-2a.

Figs. 8–10. Hard ground horizon in mudstones overlapped by pack-grainstones with sand-sized intraclasts. Erosion surface is gently undulating. Sample 7-3.

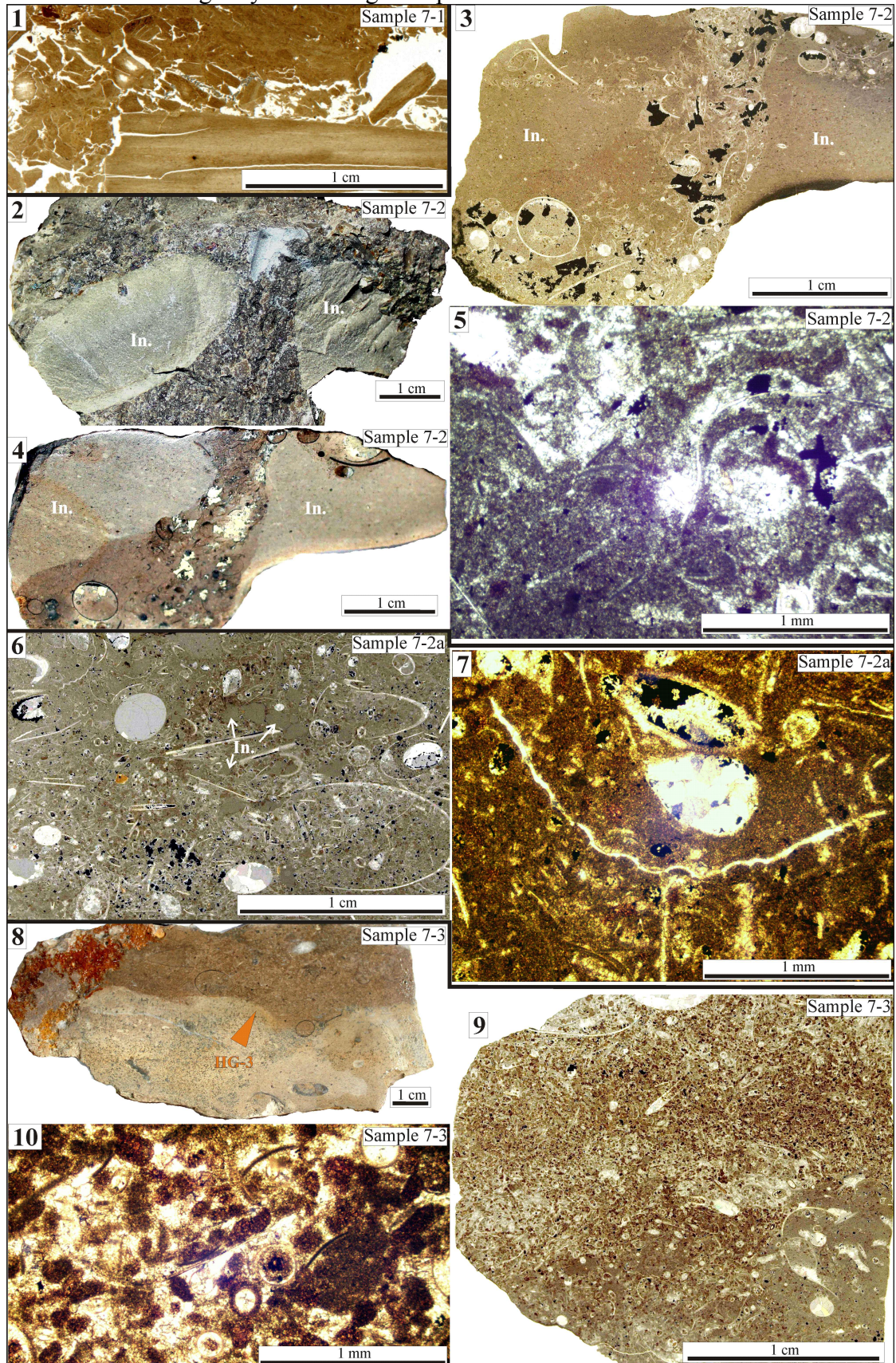


Table 31

Figs. 1–6, 8. Three layers of massive, recrystallized grainstones. These layers contain relics of sand-sized intraclasts composed of mudstone. Their content gradually decreases towards the top of the section. The roof of the upper layer (Fig. 5) has a slightly undulating erosion surface that is overlaid by black styliolinid argillites with poorly rounded intraclasts (grainstones) of sand-to-pebble size. Figs. 1–2, sample 7-4; Figs. 3–4, sample 7-5; Figs. 5–6, samples 7-6, 7-6a; Fig. 8, sample 7-6.

Figs. 7, 9, 10. Black styliolinid argillites enriched with organic matter. Sample 7-6a.

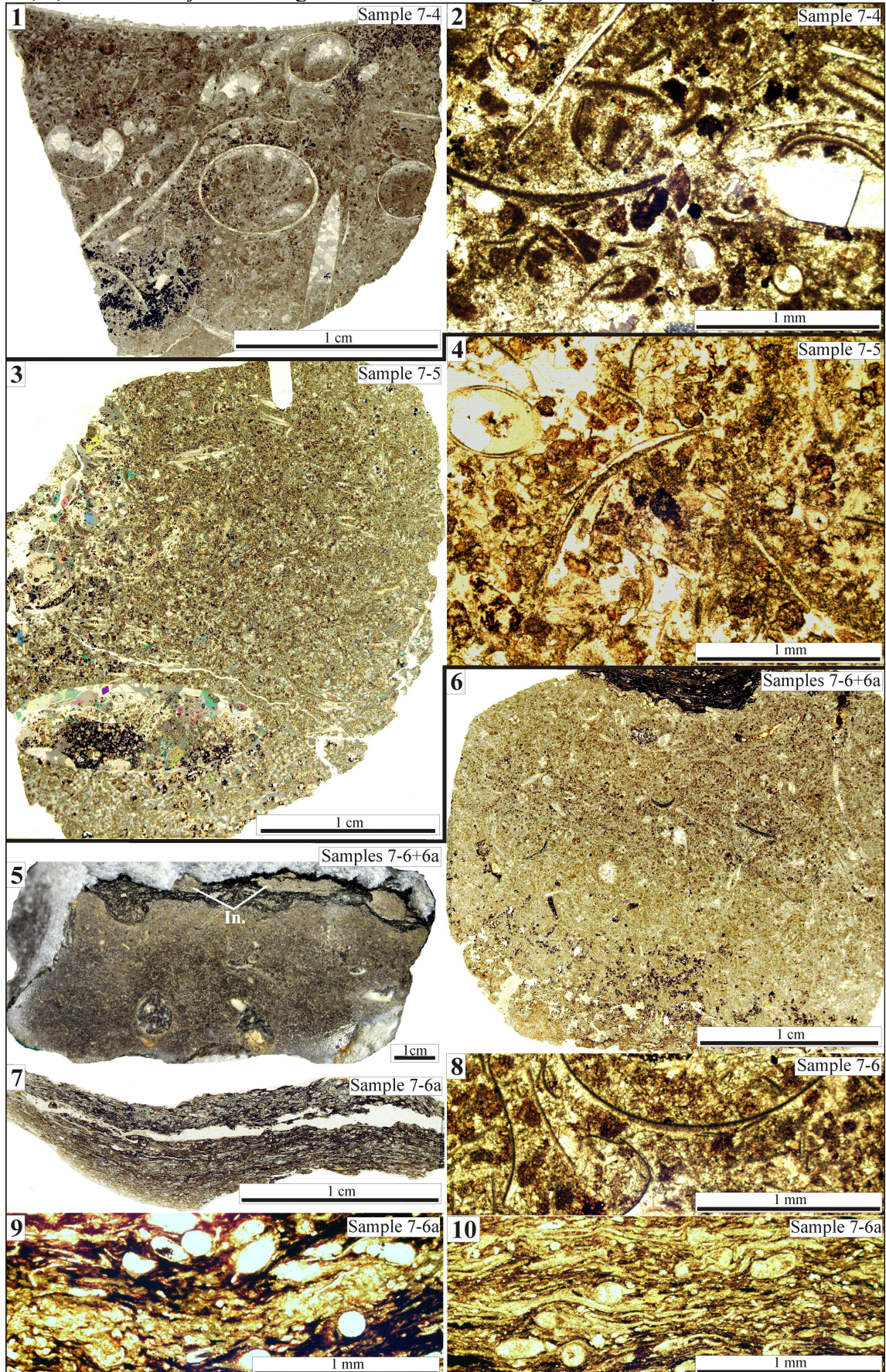


Table 32

Figs. 1–6. Thin layers of styliolinid grainstones in black argillites.

Figs. 1–2, sample 7-7; Fig. 3, sample 7-7a; Figs. 4–6, sample 7-8.

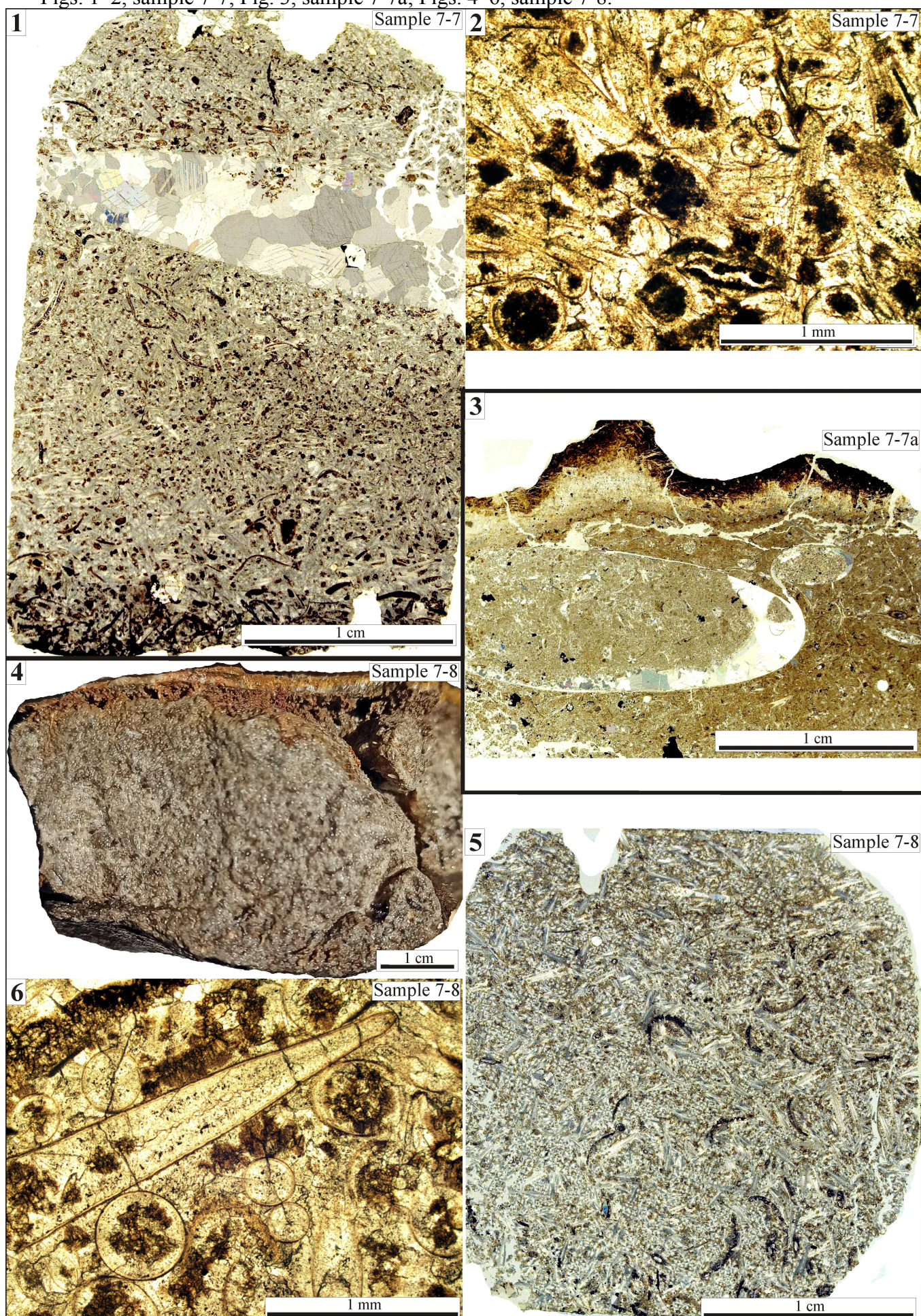


Table 33

Figs. 1–6. A series of recrystallized styliolinid grainstones layers. Occasionally, rare sand-sized intraclasts of mudstone are preserved in the relics (Fig. 2). Figs. 1–2, samples 7-9; Figs. 3–4, samples 7-10; Figs. 5–6, samples 7-11.

Figs. 7–8: The relationship between the thickness-consistent grainstone layer and the overlying, lens-shaped grainstone layer is shown in cross section. The latter forms elongated ridges in three dimensions (Fig. 8), and the deposits were probably eroded between these ridges. Samples 7-11 and 7-12.

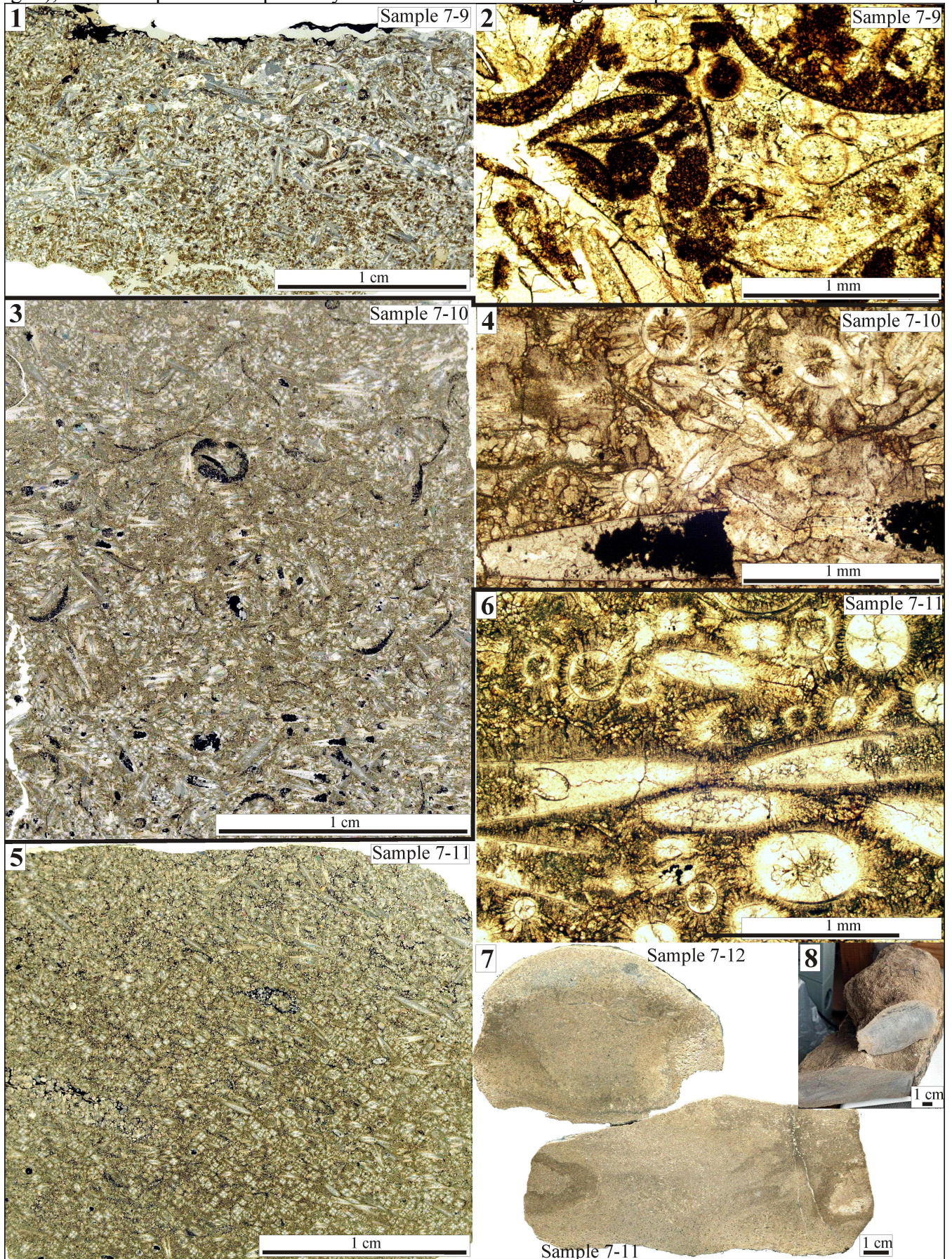


Table 34

Figs. 1–2: Recrystallized styliolinid grainstones. Sample 7-12.

Figs. 3–9: Well-rounded and flattened pebbles in styliolinid argillites (Fig. 3). The grainstones contain an admixture of sand-sized intraclasts (mudstones), styliolinids, ammonoids, nautiloids and brachiopods. Sample 7-13.

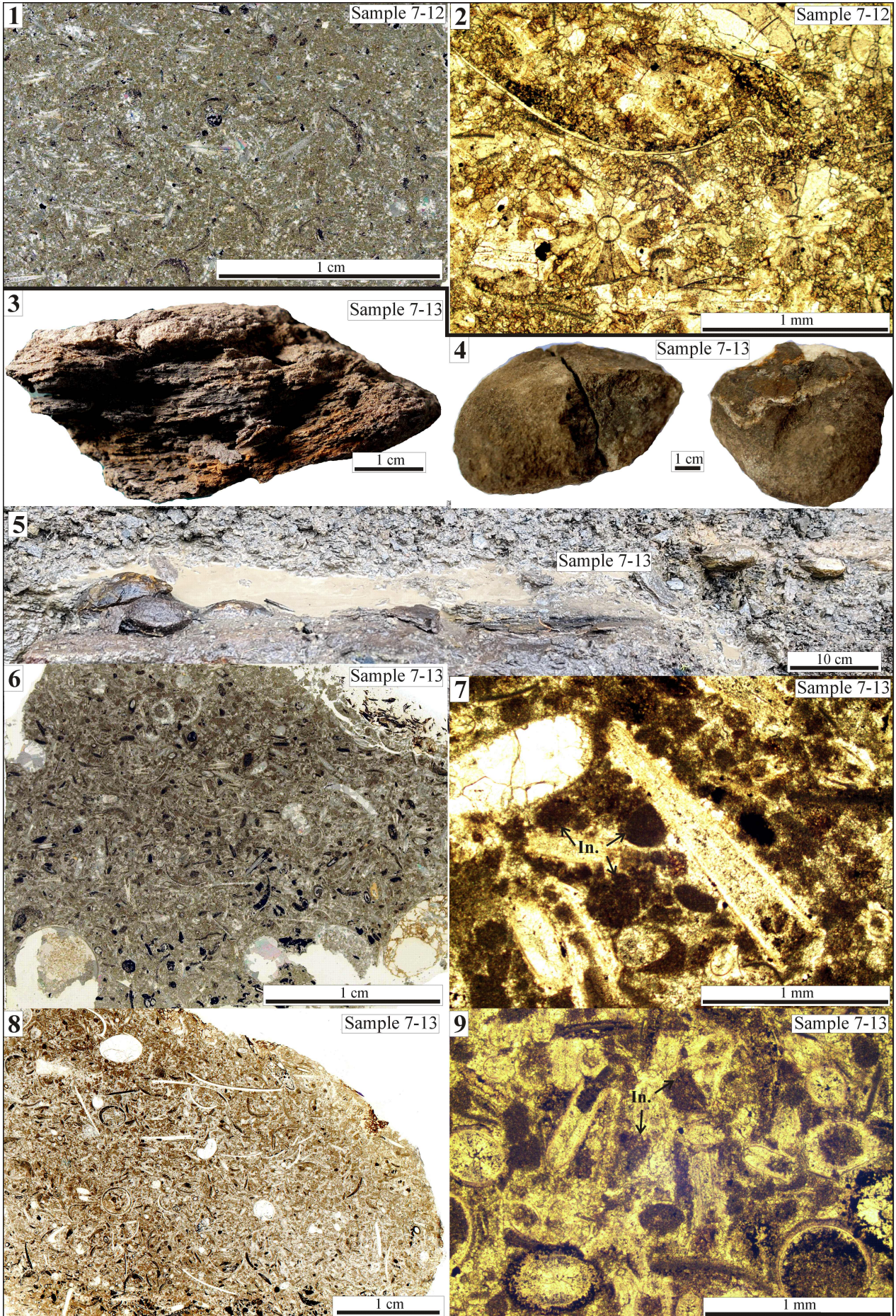


Table 35

Figs. 1–4. Well-rounded, flattened pebbles (Fig. 1) in styliolinid argillites (Fig. 2). The grainstones contain an admixture of sand-sized intraclasts (mudstones), styliolinids, nautiloids, and brachiopods (Fig. 4). The pebbles have a mineralized crust on their hard ground (Fig. 3), and a waterpass is present in the center of each pebble (in an nautiloid shell). Together, these two facts indicate that the pebbles of the eroded hard ground were buried in the argillites in an inverted state. Sample 7-14.

Figs. 5–6. A thin layer of styliolinid packstone. Sample 7-14.

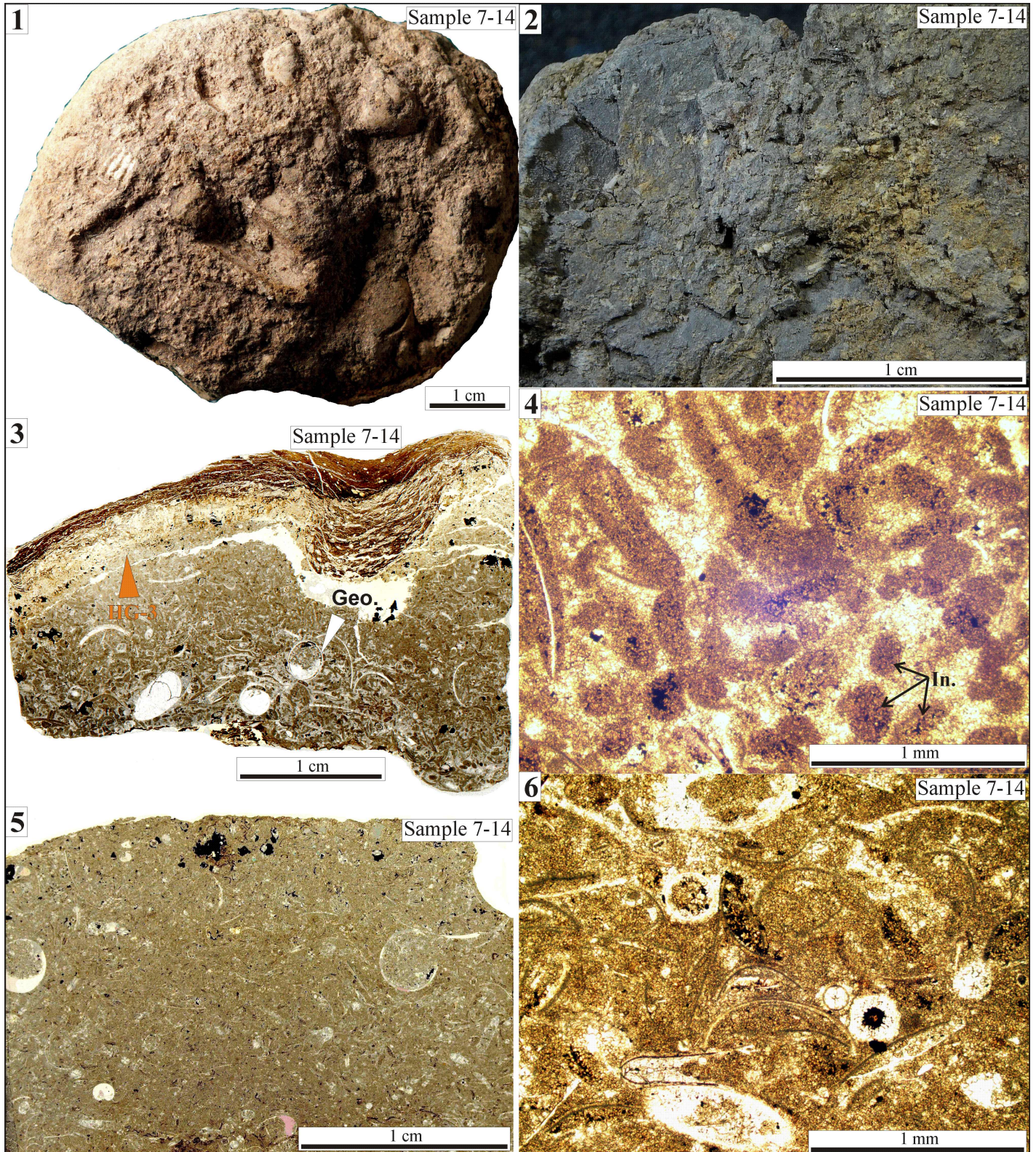


Table 36

Figs. 1–2: Low-thickness layer of recrystallized styliolinid packstone. Sample 7-16.

Figs. 3–5: Recrystallized styliolinid packstone with an admixture of fine-grained intraclasts (Fig. 4). The interlayer of black argillite in the middle part of the layer (Figs. 3 and 5). Sample 7-17.

Figs. 6–7. Black micro-bedded styliolinid argillites. Sample 7-18.

Figs. 8–9: Black micro-bedded siliceous argillites containing rare styliolinids and radiolaria. Sample 7-19.

